On
The Butterflies of the Western Ghats including Sri Lanka

The following work (in a simple form) was the product of some twenty-five years of field work throughout the Mountain Range, researches in libraries and museums - both in India and Europe. It was privately *published* in Bangalore at the Indian Institute of Science, Bangalore and the Natural History Museum, London. Copies were made freely available. Such an assessment of two mountain ranges - two biodiversity hotspots - was needed to guide the students for further study. The manuscript was accepted for publication by the Editor of the Journal of the Bombay Natural History Society late in 1996. However, they could not and did not publish it due to some technical reasons. It was the first work ever which treated the fauna of the Western Ghats in its completeness. (Note that the term "Western Ghats" and the actual mountain range doesn't appear in Evans (1932); Talbot (1939, 1949); Wynter-Blyth (1957). In relation to butterflies it was the first work of its kind. I let the work be like that for many years, because the entire fauna needed revision at every level.

After returning from Bangalore in 1997 to Europe, I began revising the entire taxonomic history of every taxa at every level. One reason was that about 380 species of these regions were bestowed upon more than four to five times names. It was important to examine who published what and when, where are the original type material today and their original type-localities. Before the year 1800, almost 140 species were described from Peninsular India by Carolus Linnaeus (only one species with certainty came from India otherwise many from China, whose names are applicable to Indian populations), J. C. Fabricius (nearly 80 species), Pieter Cramer and Casper Stoll, Dru Drury, J. R. Forster, Johann Herbst. Linnaeus, Drury, Cramer and Stoll and the Forster materials are in London at the Linnean Society and the Natural History Museum. J. C. Fabricius's materials are in the National Museum of Natural History, Copenhagen, the Natural History Museum, London and the Hunterian at Glasgow University. Only the butterflies published by Lionel de Nicéville are in the Collection of the Zoological Survey of India, Calcutta (see Gaonkar 1999). Determining the Type-Localities was a very time consuming activity. One needed to examine the unpublished material of many travellers, such as Johann Gerhard Koenig and Karl Dagobert Daldorff (from India, Thailand and Indonesia) (see Vane-Wright & Gaonkar 2006). All these will come in a future work.

Due to many reasons I was forced leave the research for many years. Many friends and well wishers have asked me to publish, particularly this work. Since I have only one copy of this work with me, annotated at various times, and I make this copy available here.

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BUTTERFLIES OF THE WESTERN GHATS, INDIA

Including Sri Lanka

A Biodiversity Assessment of a Threatened Mountain System

By

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With 5 figures and 32 Tables"

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BUTTERFLIES OF THE WESTERN GHATS, INDIA, INCLUDING SRI LANKA:
A BIODIVERSITY ASSESSMENT OF A THREATENED MOUNTAIN SYSTEM

HARISH GAONKAR[1]
(With 5 text- figures and 32 Tables)

Key Words: Lepidoptera, Butterflies, Classification, Systematics, Papilionoidea, Papilionidae, Pieridae, Nymphalidae, Lycaenidae, Hesperioidea, Hesperiidae, Distribution, Status, Endemic species, Oriental Region, India, Hot spots, Western Ghats, Kerala, Tamil Nadu, Karnataka, Goa, Maharashtra, Gujarat, Sri Lanka, Faunal Centres, History of butterfly collecting, Biodiversity Assessment, References, Museum Collections, Local Check-lists of butterflies, Faunistic works on the Indian region, Bibliography, Comparative Biodiversity Assessment.

Results of a study on the Biodiversity of Butterflies **(Insecta; Lepidoptera; Papilionoidea: Papilionidae: Pieridae: Nymphalidae: Lycaenidae; Hesperioidea: Hesperiidae)** from the **Western Ghats, India** and **Sri Lanka** are presented in systematic Tables (Tables I. 1 to I. 32). Field studies were conducted during 1987-88 (the **northern Western Ghats**, in **Maharashtra** and **Gujarat**), 1990-91 (the **southern Western Ghats**, in **Kerala** and **Tamil Nadu**), and during 1994-95 (the **central Western Ghats**, in **Tamil Nadu, Kerala, Karnataka** and **Goa**). During this period every District of this mountain range was visited several times, and in many areas where the species diversity is high, extensive field work was conducted during different seasons.

This is the first study that takes into account all **330 species** in **166 genera** belonging to **five families** (of which **37** species and **1** genus are narrow endemics of the Western Ghats) so far recorded from this mountain range and the adjacent areas. Based on the data, three **natural faunal sections** of the Western Ghats are identified, which have different geological history, but share a common floristic and faunistic history. Butterflies of **Sri Lanka (244 species with 21 endemics)** are included for comparative assessment. These two areas share about **350 (with 61 common endemics)** species, out of the **1501** species recorded from the Indian region.

Distribution and **Status** of all species are presented, based upon an extensive study of the available literature, museum specimens and information supplied by different individuals. Every effort has been made to present the data as accurately as possible. However, the structural framework in which the data is presented is to be taken as a guideline for further study and assessment. Since many butterfly species on the Western Ghats are indicators of particular (and species specific) habitats, it is possible to identify ecologically important landscapes of this mountain range, for conservation purposes, based on the diversity of species. These 330 species are dependent upon at least **1000** species of plants as larval **host-plants**, **adult attractants**, **nectar resources**, etc., many of which are also endemic to this mountain range. So, the occurrence of 300 species of butterflies in a locality would also suggest the occurrence of at least that number of plant species in that area. Another study will deal with the data on host-plant distribution and status in relation to butterflies.

The presence of faunal elements from Oriental, Palaearctic and Afrotropical biogeographical regions on the Western Ghats suggests a complex, but partially understood, natural history and biogeography. Although the total number of species is low on the Western Ghats compared with some other mountain ranges of the world, the diversity of elements involved in the total fauna makes the Western Ghats one of the most important and interesting endemic regions of the world. This complex history cannot be explained by traditional biogeographical ideas of "migration and dispersal" alone.

Only the maintenance of a contiguous belt of forest in different ecological zones, all along the Western Ghats, as it is at present, would ensure the continuation of this rich genetic diversity.

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Contents

Introduction

The most imposing, but extremely threatened, topographical, floristic and faunistic feature of the Indian subcontinent, after the Himalaya, is undoubtedly the Western Ghats. This mountain system ranges practically parallel to the west coast of India (apart from the Palghat Gap, see Figure 2), from Tamil Nadu (TN) northwards through Kerala (KE), Karnataka (KA), Goa (GO), and Maharashtra (MH), ending in south Gujarat (GU), traversing a length of about 1600 km. Spread over an area of about 175,000 sq. km in these six Indian States, this mountain range contains the remaining tropical rain forests on its western slopes. This threatened south Asian mountain system, is now regarded as one of the 18 **biodiversity centres** of the world (**"hot-spots"**); areas needing immediate conservation efforts (Wilson, 1992, see below). The Sri Lankan mountain system is also regarded as one of these.

Western Ghats areas are now practically surrounded and criss-crossed by extensive networks of railways and roads. Thus, man made fractionalization is taking place. There are more than fifty motor roads and six railway lines (all of them have been personally traversed by me) which cross the Ghats through forests. And heavy vehicular transport has caused (and is continuing to cause) extensive damage and pollution in the existing forests. Besides this, extensive agricultural, mining and plantation activities have reduced the forest cover to less than fifty percent of what it was only fifty years ago. In many areas (like in the Shiradi Ghat area of South Kanara District of Karnataka) the actual forest cover is less than 10 km in width.

Despite the fact that there are scattered references to the *Sahyādri* (the Western Ghats are so called in Sanskrit and in all other Indian languages) in ancient Indian literature (for example, in the *Sahyādri Kānda* of the *Skanda Purānā*, and other minor works), it was only after the arrival of the Europeans that we started getting written descriptions of the natural history of this mountain range. The very first critical study, with an account of the medicinal plants as they were used in various Indian traditions, was compiled by Garcia de Orta in his famous *Coloquios*, in Portuguese (1563, printed and published in Goa). This work went into many editions in several European languages, especially Latin. Inspired by this work, and the great local Ayurvedic tradition in Kerala, the then Dutch Governor of Cochin, Hendrik van Rheede, with the help of four Indian scholars and an Italian Carmelite Monk, compiled the equally famous *Hortus Indicus Malabaricus* in 12 Volumes (1686-1702, Amsterdam). These two works together describe nearly a thousand species of plants. Despite the pre-Linnaean confusion in classification, the accuracy of descriptions and illustrations (in van Rheede) provided by these works, made the task of identification, of the plants described, possible and unambiguous. However, these works did not provide any substantial descriptions of the *fauna* of this region. We search, in vain, for such descriptions in our Sanskrit (or for that matter in Pali and Prakrit) works.

Historically, in the post-Linnaean era, the very first described specimens of butterflies from the Indian region came from this area. Johan Gerhard Koenig, a Danish medical doctor and a naturalist (also a student of Linnaeus) arrived in south India in 1767 and died here in 1785. During this period, he not only collected thousands of plants, but also hundreds of insects, including butterflies. His collections of insects were sent to Copenhagen, and were described by J. C. Fabricius (a fellow student of Linneaus). About 35 species of butterflies described by Fabricius

are now housed in the Zoological Museum in Copenhagen. When the British consolidated their power over India during the late 18th and the beginning of the 19th centuries, descriptions of the natural history, especially that of butterflies signaled an entirely a new era (see references below).

Although detailed information on the butterflies of several Districts is available (e. g., T. R. Bell, 1909-1948 from North Kanara, T. B. Larsen, 1987-1988 from the Nilgiris), no systematic survey of the distribution and status of every species occurring on and around this mountain range exists today. After studying the literature and specimens deposited in museums, I began a systematic field survey, especially in those areas from where neither literature nor specimens were available. I started to explore the northern Western Ghats (in Maharashtra and Gujarat) from February 1987 to January 1988. The southern Western Ghats (Kerala and Tamil Nadu) were surveyed during 1990-91, also starting in February and ending in January. During 1994-95, the remaining Districts of the central Western Ghats (Kerala, Tamil Nadu, Karnataka and Goa) were explored. The available literature (and specimens) from this latter area is far more comprehensive than from the other two sections (Hannyngton, 1916, Home, 1934, &Yates, 1929-1933, from Coorg and of course, T. R. Bell (*op. cit.*), from North Kanara and many districts of Maharashtra). However, besides an old paper by Watson (1890), no literature is available on some important districts of Karnataka (like South Kanara, Shimoga, Hassan, Mysore and Chickmagalur) or Goa, although some specimens collected in the last century and during the beginning of this century are available in The Natural History Museum, London (BMNH), from some of these areas.

History

I have gone through practically all original descriptive literature. The very first descriptions are

to be found in Linnaeus (1758, e.g. *Papilio hector*), Fabricius (1775 onwards) and Cramer (1775 onwards). The latest description being of Yata (1990), who described a new species, *Eurema nilgiriensis*, from the Nilgiri Hills (all faunistic works and local check-lists are listed below).

I have thought it necessary, for the sake of accuracy, to use only **valid** binominal species names, instead of trinominal subspecies names, in the following Tables. The main reason for this is that these 330 species of butterflies have had more than 1500 names bestowed upon them during the last two hundred and fifty years. Many subspecific names in use today are simply junior synonyms of valid species names. Besides, with such a long and confusing taxonomic history, it has been time consuming to find out who described what taxon from where, which name has priority over what, and from where the actual type specimens came from (my forthcoming book on the Butterflies of the Western Ghats will discuss all such issues). However, the valid specific names used in the following study should provide stability and correctness. Since many groups of butterflies represented on the Western Ghats have not received rigorous phylogenetic treatment, it is likely that generic groupings (and therefore, generic names) will change. Until then, I hope these specific names will be useful. For those who wish to study further, major reference works are listed below.

This is the first study which takes into account all butterfly species found within this mountain range and adjoining areas. It also provides extensive and up-to-date distributional data for all these species. The total number of species (330) from such a large mountainous area is not particularly rich, compared to species diversity in some other mountain ranges of the world. But, what is interesting (and important) is that in some districts more than 300 species are found,

clustered around complex ecological zones. Areas like Idukki District, south of the Palghat Gap (in Kerala, including the Eravikulam National Park), Wynaad-western Nilgiris (in Kerala-Tamil Nadu, including the famous Silent Valley National Park), Coorg-South Kanara (in Karnataka); North Kanara (in Karnataka) and southern Goa, have maximum diversity. Except in Goa, all these districts have about 300 species. Corresponding floral diversity, that supports such a faunal diversity, can be inferred from this. Another study under preparation by me will document the floral diversity, their distribution and status in relation to butterflies (Gaonkar, in prep).

The assessment of the current status and distribution of species is based on actual field work, extending back to my boyhood days in Goa. The distributional range and status of many species have changed a great deal in the last two hundred years. Many butterfly species collected by J. G. Koenig in the 18th century (from 1765-1785), and E. Y. Watson in the late 19th century from east of the Western Ghats in Tamil Nadu and Karnataka, have become rare or extinct in their former localities. During my own survey period (between 1987 to 1995), a rapid degradation has taken place everywhere, especially in Kerala, Tamil Nadu and Goa. Further details of ecology and information from published material will be discussed in the final assessment and in my book. This information will provide a basis for the ecological history of each area.

The Tables reproduced below quite clearly establish the south/north distribution of species. The Table entries are arranged as follows. Each table documents a Family, divided into a number of Subfamilies and Tribes. Each Subfamily and the Tribes under them are arranged in a closed box. For the generic status of every species represented within the Western Ghats, I have endeavoured to follow all relevant revisionary works available on the world fauna (not all of them are included

in this study, but my Annotated Bibliography lists all of them. The most important ones are listed below).

The distributional status of every known species is provided for each of the six States, based on present data. The status data comes first and foremost from my own field studies, comparative data are taken from published works, and locality information attached to museum specimen labels. An asterisk (*) after a name indicates the presence of that species in Sri Lanka. Data from there is based on my visits to that island, besides information attached to specimen labels in museum collections and from published literature. A name in **bold face** indicates that the species is endemic to peninsular India (land south of the Tapti and Godavari rivers, including the Western Ghats) and Sri Lanka. (Examples: ***4 Pachliopta hector, 16 Papilio polymnestor, 19 Papilio crino)***. Those that do not have an asterisk, but are in bold face, are species found *only* within the Western Ghats complex and adjacent areas, but not in Sri Lanka. (Examples: ***1 Troides minos, 2 Pachliopta pandiyana, 12 Papilio liomedon, 13 Papilio dravidarum, 18 Papilio buddha).*** Sri Lankan endemics are listed below the box of each group. Species which are listed only from Kerala and Tamil Nadu are high altitude butterflies found only on the Nilgiris, Palnis, Anaimalais and the Kerala highlands, above 1800 mt (Examples are: ***28 Colias nilagiriensis, 32 Pieris canidia***).

The present status of each species is described as follows: **"Yes"** indicates that it is present in that State. A **"+"** indicates that it is present in all the Western Ghats Districts of that State, whether found disjunctly or contiguously. A **"-"** indicates that it is not found in all the Western Ghats Districts of that State, but has restricted distribution. For example, the rare ***54 Parantirrhoea***

marshalli is so far known only from three localities in Kerala and two localities in Karnataka, and is not recorded in Tamil Nadu. However, this only indicates the lack of field data, not necessarily the actual status of that species on this mountain range. On the contrary, there is evidence to believe that it may be found in all the Districts of Kerala and further north to the Sharavati Valley (in North Kanara District), wherever its host-plant, the bamboo ***Ochlandra scriptoria*** occurs. So, we will have to search for such species, even if its habitat coincides with King Cobra country! A **"C"** indicates that the species is quite common. Examples: *3 Pachliopta aristolochiae, 7 Graphium agamemnon, 11 Papilio demoleus,* species which are able to thrive in a variety of ecological zones on a variety of host-plants. A **"R"** indicates the natural rarity of species that are often restricted to specific ecological zones, dependent on specific and rare host-plants that also have restricted range. But host-plants have slightly broader distributional ranges than the butterflies feeding on them. Examples: ***2 Pachliopta pandiyana, 12 Papilio liomedon, 13 Papilio dravidarum, 18 Papilio buddha, 19 Papilio crino.*** Host-plants of all these species have a much broader range on the Ghats as well as on the plains. Those species that are not in bold face, are widely distributed outside of the Western Ghats or Western Ghats and Sri Lanka (like *Eurema hecabe,* Pieridae). **"NO"** indicates that the species is either not found at all in that State, or its presence there is unconfirmed. A **"?"** indicates uncertain and inadequate data on the species occurrence in that State.

The Western Ghats fauna contains elements from three major biogeographical regions: the Oriental Region (majority of species), the Palaearctic Region (four species) and the Afrotropical Region. I am now preparing a comparative biogeographical study of the composition of different elements from these regions. Overall patterns suggest that the areas in the three southern States

(KE, TN, KA) contain the majority of species (including the endemics, which roughly constitute about 20 per cent, but in some groups like the Papilionidae nearly one-half the total number). As a preliminary analysis, it can be stated that the Ghats in Tamil Nadu and Kerala south of the Palghat Gap (see Figure 2) contain the maximum number of species (about 317). The second area of maximum diversity is found on the Ghats in Tamil Nadu, Kerala and Karnataka north of the Palghat Gap (about 316 species). This diversity, slowly decreasing, extends north from the Nilgiris and Wynaad through Coorg, South Kanara and North Kanara to southern Goa (see Table I. 30). The density of species decreases in the two northern States of Maharashtra and Gujarat. Whereas Kerala has a total of 313 (plus) species, Gujarat has less than 160 species. This pattern is clearly indicative of the type of forests these States have, irrespective of the great deal of human disturbance that has taken place during recent years.

Based upon the distribution and status of the butterflies and their host-plants, we can recognise three biogeographical sections for the Western Ghats fauna. These centres also contain absolutely priority areas of conservation. The first and the most important section, is the **southern Western Ghats,** which starts from just north of Nagercoil (Tamil Nadu) extends north up to the Palghat Gap (south of lat. 11°N, see Figure 2). This area sustains the largest number of species, as well as most of the endemics. The unique species of butterflies of this area are ***70 Mycalesis oculus*** and ***82 Ypthima ypthimoides*** (and possibly also ***72 Mycalesis davisoni***) that do not occur north of the Palghat Gap. This is also evidenced by the high endemicity in plants here. This area also contains all of the Palaearctic elements on the Western Ghats. However, it is also, faunistically, the *least studied* section, as well as ecologically the *most disturbed*. Lowland evergreen forests, which were characteristic of Kerala only a few decades ago, have mostly been replaced by

plantations and intense human activity of all kinds continues in whatever is left.

The second important section, the **central Western Ghats**, starts north of the Palghat Gap from the Nilgiri-Wynaad area upto south Goa. However, some endemic elements reach all the way north to southern Maharashtra (at least up to the Amboli Ghat area in Savantvadi Taluk, south of lat. 16°N). This is where the distribution of many endemic species abruptly ends. This section contains less species than the southern section, and endemism is also less here. The only butterfly unique to this area is ***71 Mycalesis adolphei***. However, unlike the southern section, this region is broader in terms of latitude (and area), and has the best preserved forests (especially in Karnataka) as well as higher density of butterfly populations. Conservation activity has also been much more active in this region than in the southern section. The butterfly fauna of this area has also been better documented than that of any other area in the Indian subcontinent, except perhaps Sikkim. But major studies have been only carried out in three Districts: the Nilgiris, Coorg and North Kanara. Apart from Torben Larsen's (1987-1988) work from April to October 1986 on the Nilgiris, all major surveys date back 70 years.

The third section, the **northern Western Ghats**, is in Maharashtra and south Gujarat. This area contains only about 200 species north of the Amboli Ghat, and many species from the central Western Ghats do not occur in this area. North Kanara District has nearly 300 (well documented by T. R. Bell and this study) species and Goa about 250 species (this study), which *means* that more than 100 species found in North Kanara do not occur in Maharashtra. This is also evidenced by the patterns of distribution of the (host-)plants. The gradual disappearance of the tropical rain

forest in Maharashtra in recent historical times is probably the primary cause for this poor butterfly diversity. Nevertheless, there are isolated patches of this type of forest still to be found in that State along the western slopes, an evidence of its former extent. Older maps used to depict the existence of such forests in Maharashtra all the way to south of Mumbai (Bombay). The poor butterfly diversity on the Maharashtra Ghats can also be explained by the fact that more than half the species of the Western Ghats occur within the evergreen type of vegetation and ecology. Good indicator plant species (among many) of this type of vegetation are the evergreen *Aristolochia tagala* (found also on the eastern Himalaya and in Andaman and Nicobar Islands, but not in Sri Lanka) and ***Thottea siliquosa*** (found only on the Western Ghats and in Sri Lanka), both of the family Aristolochiaceae, that do not occur in the northern section, although the latter is found in isolated pockets in south Maharashtra. However, the monophagous endemic butterfly, ***Pachliopta pandiyana,*** which is dependent exclusively on ***Thottea siliquosa*** as its host-plant, does not occur there. It is very rare in southern Goa, but plentiful in North Kanara. But, the oligophgous endemic, ***Troides minos***, that uses both these plants occurs also in isolated areas in southern Maharashtra.

The Western Ghats area now supports practically all of the butterfly fauna of peninsular India, south of the Himalaya, and virtually all species found south of the Satpuras. Nearly two-thirds of its fauna is not found in the rest of peninsular India [compare Bangalore District which has about 140 species (Yates, 1933 and pers. obs.), Delhi (Donahue, 1967 and T. B. Larsen pers. comm.), and the adjacent area less than 80 species]. Sri Lanka and the Western Ghats together have about 350 species, out of which 61 are shared endemics in these regions, that are not found anywhere else in the world. This amount is almost one-fifth of the total Indian region butterfly fauna. Sri Lanka has 21 endemics that do not occur anywhere else, whereas the Western Ghats area have

37 narrow endemics. Taxonomic uniqueness is not very high, only one genus is endemic to the area, the narrow endemic ***Parantirrhoea*** and (***Zesius*** also found on the Himalaya), of uncertain taxonomic status, probably belonging to the Melanitini (R. I. Vane-Wright, *in litt.*). The monotypic genus ***Zesius*** (Eliot, 1973) is found only in Sri Lanka, on the Western Ghats and also on the eastern Himalaya. All groups have some endemics, but in a group like the Papilionini, out of 10 species (Table 1), 3 species, ***Papilio liomedon, P. dravidarum*** and ***P. buddha,*** do not occur anywhere else (about 30 percent). Two species, ***Papilio polymnestor*** and ***Papilio crino*** (entirely allopatric with ***P. buddha*** on the Western Ghats), are shared endemics of Sri Lanka and the Indian region. Sri Lanka has no endemic Papilionini. In the rest of the families, the endemism decreases to about 10-20 percent.

The present data from this study will be put onto the WORLDMAP, which is being developed at The Natural History Museum in London [British Museum (Natural History)] on a quarter degree scale. This computer software is a graphical tool for the fast, interactive assessment of priority areas for conserving biodiversity. An Atlas of the distribution of all species will then be available for identifying the biodiversity-rich areas. So far, only about 6 percent of the forest area of the Western Ghats are under protected status. Many more areas that are rich in diversity, but are not under protection, will have to be recognized, contiguously, along the western slopes of the Ghats. This rich diversity can only be maintained, in the long run, if there are contiguous forests of different ecological zones along these slopes. Contiguous forests will also help to maintain a constant gene flow between different populations of both plants and butterflies (besides other wildlife).

Butterflies are probably better known and studied than any other fauna, except perhaps, birds. But unlike bird diversity, which is supplemented seasonally by migrations from the north, butterflies are spatially restricted. Every district in Kerala has more butterflies than North Kanara District, but North Kanara has more birds than butterflies in compared to all the districts of Kerala. A unique feature of the Western Ghats is that an area with rich butterfly diversity is also an area rich in all other faunal and floral diversity (documented and explained in my second assessment report). I hope that this study may be useful in recognizing such areas for conservation and protection. Also, perhaps, to be consulted as a model by researchers using other animal and plant groups for biodiversity assessment of the entire Western Ghats, or of a regional area, a District or a State.

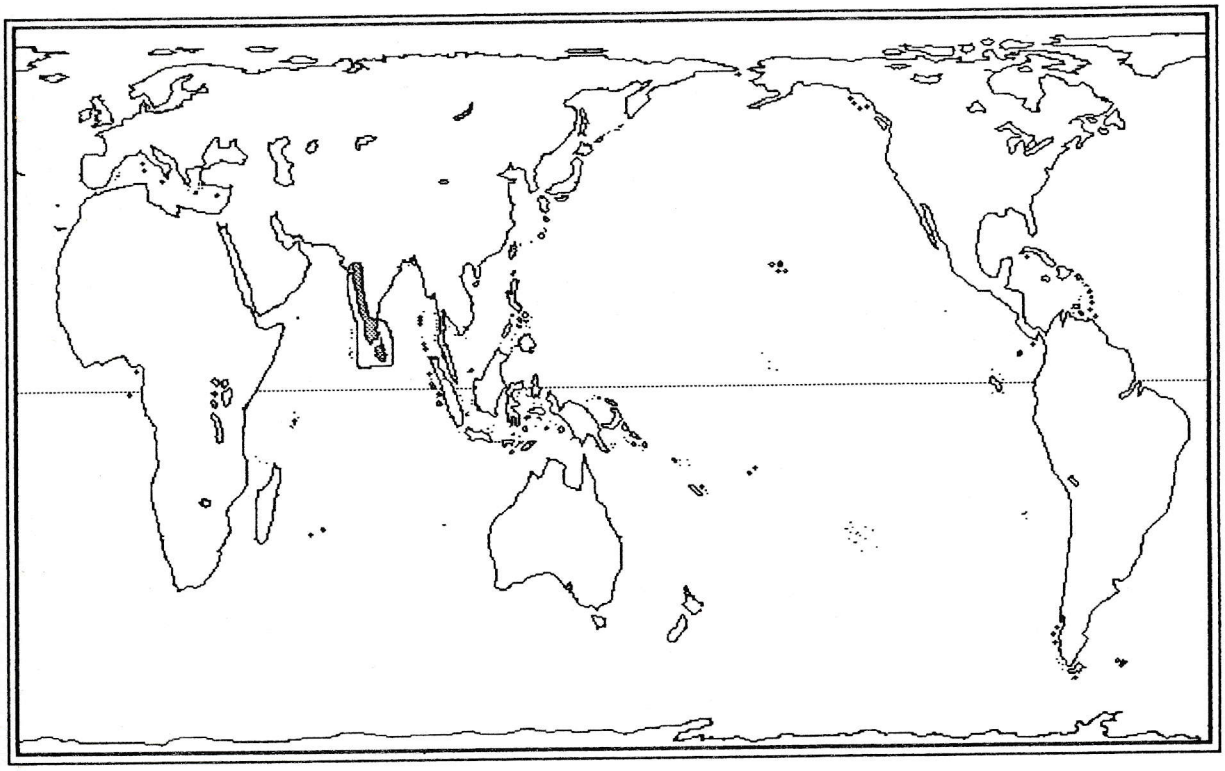

Figure 1. The world map, drawn using Peters Projection, showing the area of the Western Ghats, India (see Figure 2) and the island of Sri Lanka. Despite the intense pressure from expanding local populations, agricultural, mining and industrial activity, these areas still contain some of the last remaining primary tropical rain forests of the Indian subcontinent. These areas are the home of more than 6000 plant species, of which 40 percent are reported to be endemic. However, no estimation of their insect diversity exists, which will run into hundreds of thousands of species, when each area is thoroughly explored. An analytical study of an important group of insects is presented in this work. Out of an estimated 350 described species of butterflies (this study), 61 species are endemic to these areas, most of which are now very localized and threatened, due to habitat destruction. These two areas are now recognized as "Hot Spots", and both are in need of urgent biodiversity analysis. (HG96)

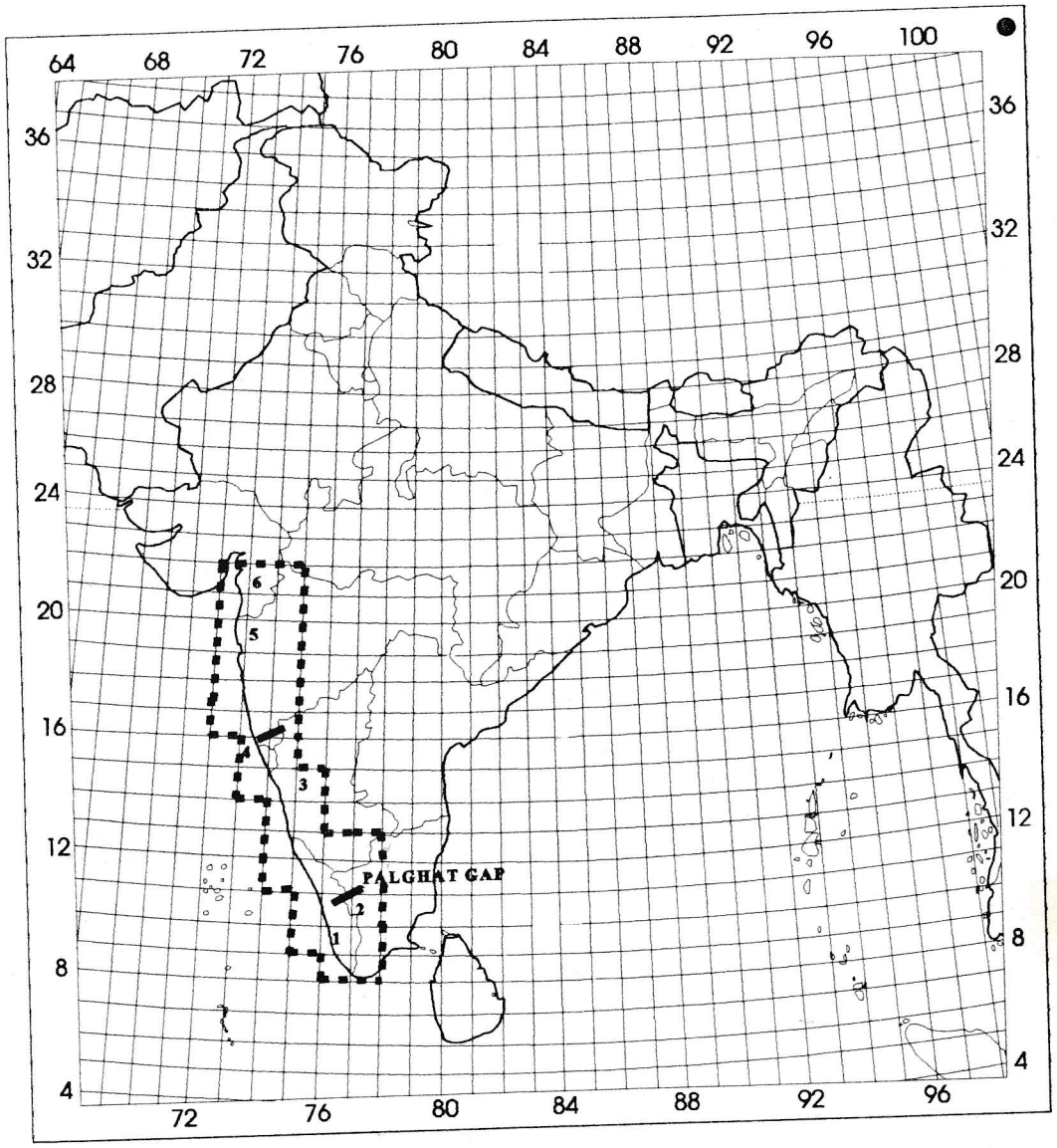

Figure 2. Western Ghats area included in this study. The States from the south are: (1) KE: Kerala; (2) TN: Tamil Nadu; (3) KA: Karnataka; (4) GO: Goa; (5) MH: Maharashtra; (6) GU: Gujarat. Note that only Kerala and Goa are entirely within the Western Ghats complex, and only Kerala and Tamil Nadu are both south and north of the Palghat Gap. Strictly endemic species found south of this Gap do not occur in the north. Two thick lines show different sections of the mountain range, which is discussed in the text. The Biligirirangan Hills is included in this study, since that area contains predominantly Western Ghats fauna and flora. (HG96).

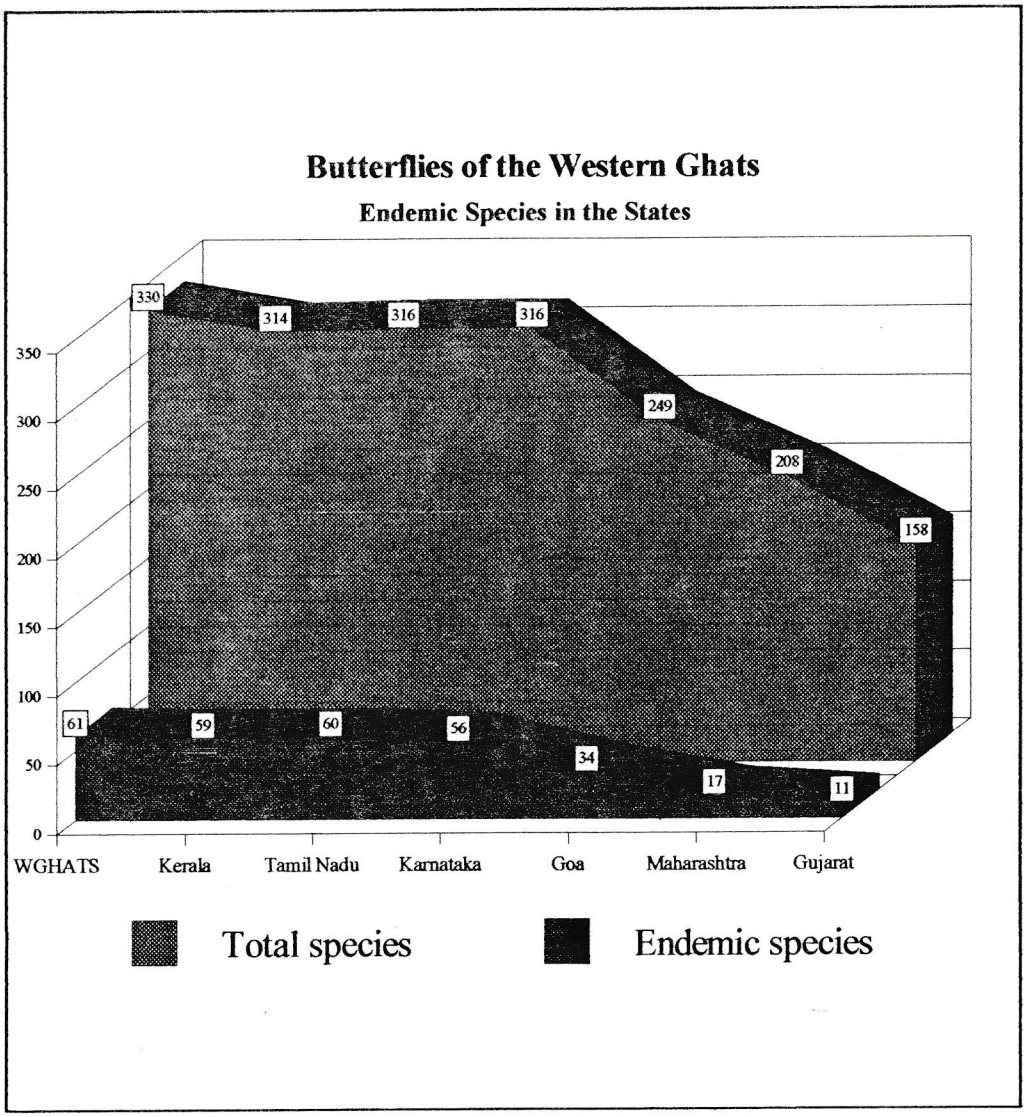

Figure 3. An area chart showing the butterflies of the Western Ghats (330 species, this study) and different States (in the background). The occurrence of shared endemic species of the Western Ghats and Sri Lanka in six States are shown in the foreground, see below Table I. 30 and I. 31 for narrow endemics in each area and States. Note that the decline in species numbers occurs from south to north. (HG96)

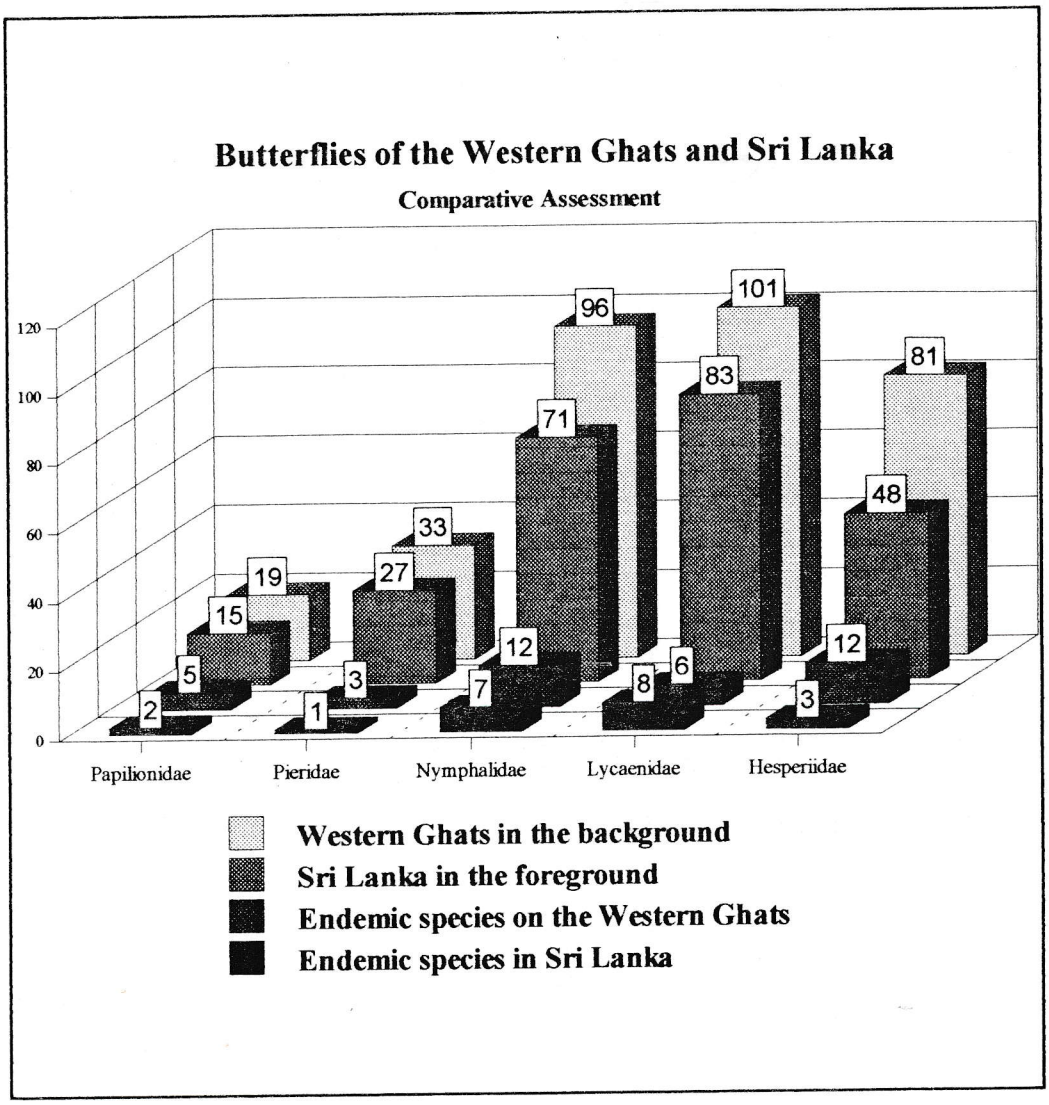

Figure 4. The distribution of different families of butterflies on the Western Ghats and in Sri Lanka. Back rows show total number of species, whereas numbers in front rows are strict endemics. Note that only in the family Lycaenidae, Sri Lanka has more endemics than the Western Ghats. (HG96)

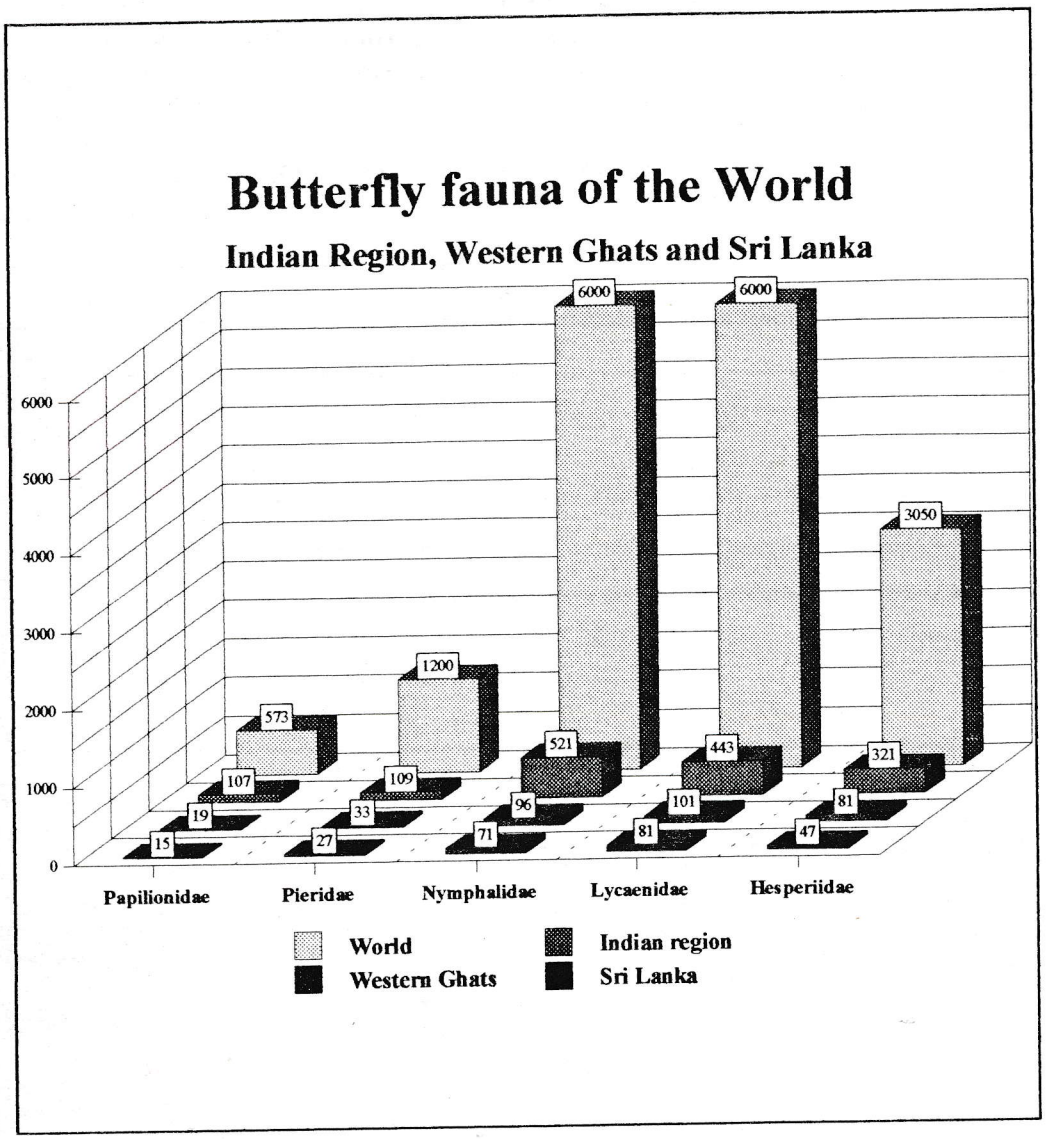

Figure 5. Diversity of Butterfly fauna of the World, the Indian Region, the Western Ghats and Sri Lanka, divided into five families. Note that the family Nymphalidae contains all the groups formerly treated as separate families (see Figure 4). It is only in the family Papilionidae that the Indian Region has nearly one fifth of the World fauna. In all other families the share declines from about one ninth to one twelfth. This percentage makes the Indian region one of the ten megabiodiversity areas in the world. (HG96).

Systematics of the Butterflies of the Western Ghats and Sri Lanka

Table series I. Present Distribution and Status.

(**Endemic species** of the Western Ghats, peninsular India and Sri Lanka together are in **bold face**.
Numbers within brackets ( ) indicate **endemic species**. Strict Sri Lankan **endemics** are numbered from **1** to **21**)

Table I. 1. PAPILIONOIDEA: PAPILIONIDAE: Papilioninae: Troidini: Leptocircini: Papilionini

Species	States					
Papilioninae: Troidini	KE	TN	KA	GO	MH	GU
1. Troides minos	Yes + C	Yes + R	Yes + C	Yes + C	Yes - R	No
2. Pachliopta pandiyana	Yes + R	Yes - R	Yes + R	Yes - R	No	No
3. Pachliopta aristolochiae *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
4. Pachliopta hector*	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R
Troidini : 4 (3)	4 (3)	4 (3)	4 (3)	4 (3)	3 (2)	2 (1)
Papilioninae:Leptocircini	KE	TN	KA	GO	MH	GU
*5. Graphium sarpedon**	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + R
*6. Graphium doson**	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R	Yes - R
*7. Graphium agamemnon**	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
*8. Graphium nomius**	Yes + C	Yes + C	Yes + C	Yes + R	Yes - R	Yes - R
*9. Graphium antiphates**	Yes - R	Yes + C	Yes + C	Yes - R	No	No
Leptocircini: 5	5	5	5	5	4	4
Papilioninae: Papilionini	KE	TN	KA	GO	MH	GU
*10. Papilio clytia**	Yes + C	Yes + C	Yes + C	Yes + C	Yes + R	Yes- R
*11. Papilio demoleus**	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
12. Papilio liomedon	Yes + R	Yes - R	Yes + R	Yes - R	No	No
13. Papilio dravidarum	Yes - R	Yes - R	Yes - R	Yes - R	No	No
*14. Papilio helenus**	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R
*15. Papilio polytes**	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
16. Papilio polymnestor*	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R
17. Papilio paris	Yes - R	Yes - C	Yes + C	Yes - R	Yes - R	No
18. Papilio buddha	Yes - R	Yes - R	Yes + R	Yes - R	No	No
19. Papilio crino*	Yes - R	Yes - R	Yes - R	No	No	No
Papilionini: 10 (5)	10 (5)	10 (5)	10 (5)	9 (4)	6 (1)	5 (1)
PAPILIONIDAE 19(8)	**19 (8)**	**19 (8)**	**19 (8)**	**18 (7)**	**13 (3)**	**11 (2)**

* Sri Lanka: **PAPILIONIDAE: 15 (5) species** : Troidini (including ***1. Troides darsius*** and ***2. Pachliopta jophon***, both endemics): 4 species; Leptocircini: 5 species: Papilionini: 6 species.

Table I.2. PIERIDAE: Coliadinae: Coliadini

Species	States					
Coliadinae: Coliadini	KE	TN	KA	GO	MH	GU
20. Catopsilia pomona *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
21. Catopsilia pyranthe *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
22. Eurema brigitta *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
23. Eurema laeta *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
24. Eurema hecabe *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
25. Eurema blanda *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
26. Eurema andersoni	Yes - R	Yes - R	Yes - R	No	No	No
27. Eurema nilgiriensis	Yes - R	Yes - R	Yes - R	No	No	No
28. Colias nilagiriensis	Yes - C	Yes - C	No	No	No	No
Coliadini: 9 (2)	9 (2)	9 (2)	8 (1)	6	6	6

* Sri Lanka : Coliadini: 7 (1) species, (including ***3. Eurema ormistoni***, an endemic species)

Table I.3. PIERIDAE: Pierinae: Pierini

Species	States					
Pierinae: Pierini	KE	TN	KA	GO	MH	GU
29. Delias eucharis *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
30. Leptosia nina *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
31. Prioneris sita *	Yes + R	Yes + R	Yes + R	Yes - R	Yes - R	No
32. Pieris canidia	Yes - C	Yes - R	No (?)	No	No	No
33. Cepora nerissa *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R
34. Cepora nadina *	Yes + C	Yes + C	Yes + C	Yes - C	Yes + R	Yes - R
35. Anaphaeis aurota *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
36. Appias indra *	Yes - R	Yes - R	Yes - R	Yes - R	No	No
37. Appias libythea *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
38. Appias lyncida *	Yes - R	Yes - R	Yes - R	Yes - R	Yes - R	No
39. Appias albina *	Yes - R	Yes - R	Yes - R	Yes - R	Yes - R	No
40. Appias wardi	Yes - R	Yes - R	Yes - R	Yes - R	No	No
41. Colotis amata *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
42. Colotis etrida *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
43. Colotis eucharis *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
44. Colotis danae *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
45. Colotis fausta *	No	No	No	No	No	Yes - R
46. Colotis phisadia	No	No	No	No	No	Yes - R
47. Colotis vestalis	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
48. Ixias marianne *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
49. Ixias pyrene *						
Pierini: 21 (3)	19 (3)	19 (3)	18 (3)	18 (3)	16 (2)	15 (1)

* Sri Lanka: number of Pierini: 18 (2) species. (*Appias paulina* is present in Sri Lanka, but not in south India). *Delias hyperete* from the northern Eastern Ghats does not occur in the study area. 46 and 47, these two species have extended their range in recent years further south into Gujarat along the drier regions (personal observation).

Table I.4. PIERIDAE: Pierinae: Euchloeini.

Species	States					
Pieridae: Euchloeini	KE	TN	KA	GO	MH	GU
50. Pareronia valeria	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes -R
51. Pareronia ceylanica *	Yes + C	Yes - C	Yes + C	Yes - R	No	No
52. Hebomoia glaucippe *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R	Yes - R
Euchloeini : 3 (1)	3 (1)	3 (1)	3 (1)	3 (1)	2	2
PIERIDAE 33 (6)	**31 (6)**	**31 (6)**	**29 (5)**	**27 (4)**	**24 (2)**	**23 (1)**

* Sri Lanka: Euchloeini: 2 (1) species. **PIERIDAE: 27 (5) species.**

Table I. 5. NYMPHALIDAE: Morphinae: Amathusiini.

Species	States					
Morphinae: Amathusiini	KE	TN	KA	GO	MH	GU
53. Discophora lepida *	Yes + R	Yes - R	Yes + R	Yes - R	No	No
Amathusiini: 1 (1)	1 (1)	1 (1)	1 (1)	1 (1)	No	No

* Sri Lanka: Morphinae: 1 (1) species. (See Harvey in Nijhut and de Jong *et al.* below). Evans (1932) Wynter-Blyth (1957:134) included *Amathusia phidippus* from Travancore (Kerala) based apparently on Fergusson's check-list (1891). Nobody has since seen that species in Kerala (I did not see it during my survey in Kerala, also Elamon, pers. Comm.). It was probably based on misidentification.

Table I. 6. NYMPHALIDAE: Satyrinae: Melanitini

Species	States					
Satyrinae: Melanitini	KE	TN	KA	GO	MH	GU
54. Parantirrhoea marshalli	Yes - R	No	Yes - R	No	No	No
55. Melanitis leda *	Yes + C	Yes - C	Yes + C	Yes + C	Yes + C	Yes -C
56. Melanitis zitenius	Yes + C	Yes + C	Yes + C	Yes - C	No	No
57. Melanitis phedima *	Yes + C	Yes - C	Yes + C	Yes + C	Yes - C	No
Melanitini: 4 (1)	4 (1)	3	4 (1)	3	2	1

* Sri Lanka: Melanitini: 2 species. The monotypic genus ***54. Parantirrhoea*** is endemic to the Western Ghats, and not found in Sri Lanka or in other areas of Oriental Region.

One specimen in Sharman Collection in NHM (WB-1957:)!!!!

Zitenius, Herbst, 1796. (Coromandal)

x singhala F x F _ ?

** Bernard thinks, it is a distinct speci

Orcha Evans, 1912

ADD Lethe neelgheriensis !

Table I.7. NYMPHALIDAE: Satyrinae: Elymniini: Satyrini

Species	States					
Satyrinae: Elymniini	KE	TN	KA	GO	MH	GU
58. Elymnias hypermnestra *	Yes + C	Yes - C	Yes + C	Yes + C	Yes + C	Yes - C
59. Lethe europa	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R
60. Lethe drypetis *	Yes + C	Yes - R	Yes + C	Yes - R	Yes - R	No
61. Lethe rohria *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R	No
62. Mycalesis anaxias	Yes + C	Yes - R	Yes - R	No	No	No
63. Mycalesis perseus *	Yes + C	Yes - C	Yes - C	Yes - C	Yes - R	Yes - R
64. Mycalesis mineus *	Yes + C	Yes - C	Yes + C	Yes - R	Yes - R	No
65. Mycalesis subdita *	Yes - R	Yes - R	Yes - R	No	No	No
66. Mycalesis igilia	Yes - R	Yes - R	Yes - R	No	No	No
67. Mycalesis visala	Yes - C	Yes - C	Yes - C	No	No	No
68. Mycalesis orcha	Yes - C	Yes - R	Yes - R	No	No	No
69. Mycalesis patnia *	Yes - C	Yes - R	Yes - C	Yes - C	Yes - R	No
70. Mycalesis oculus	Yes - C	Yes - R	No	No	No	No
71. Mycalesis adolphei	Yes - C	Yes - C	Yes - R	No	No	No
72. Mycalesis davisoni	Yes - R	Yes - R	No	No	No	No
73. Orsotriaena medus *	Yes + R	Yes - R	Yes + C	Yes - R	No	No
74. Zipoetis saitis	Yes - R	Yes - R	Yes - R	No	No	No
Elymniini: 17 (9)	17 (9)	17 (9)	15 (7)	8 (2)	7 (2)	3
Satyrinae: Satyrini	KE	TN	KA	GO	MH	GU
75. Ypthima asterope	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
76. Ypthima ceylonica *	Yes + C	Yes + C	Yes - C	Yes - R	No	No
77. Ypthima huebneri	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
78. Ypthima avanta * **	Yes - C	Yes - C	Yes - C	Yes - R	Yes - R	No
79. Ypthima baldus	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
80. Ypthima philomela	Yes - R	Yes - R	Yes - C	No	No	No
81. Ypthima chenui Chenui	Yes - C	Yes - C	Yes - R	No	No	No
82. Ypthima ypthimoides	Yes - C	Yes - C †	No	No	No	No
Satyrini: 8 (3)	8 (3)	8 (3)	7 (2)	5 (1)	4	3
Satyrinae: 29 (13)	29 (13)	28 (12)	26 (10)	16 (3)	13 (2)	7

* Sri Lanka: **Satyrinae: 16 (5) species;** Elymnini: 12 (3); Satyrini: 6 (2). ***4. Elymnias singala, 5.Lethe daretis, 6. Lethe dynsate*** ,***7.Mycalesis rama*** are endemic to Sri Lanka. ***70. Mycalesis oculus*** is found only south of the Palghat Gap. ***71. M. adolphei*** is found only in the north. ***81. Ypthima chenui*** is found both south and north of the Palghat Gap. ***82. Ypthima ypthimoides*** is found only south of the Palghat Gap.

Valid.

** It is either Y. singala (x R. Felder, 1865

or Y. striata Hampson, 1889. [should Y. singala prove to be a separate species, then Y. striata Hampson should be applied to the Nilgiri and Palni and Kerala speci].

** M. patnia (closer to Madagascarean species).

Fabricius, 1775

Also look up!! Y. baldus (x R. Felder, 1865

Y. avanta Moor (= Y. lisandra M)

Striata Hampson, 1889

Table I. 8. NYMPHALIDAE: Charaxinae: Charaxini

Species	States					
Charaxinae: Charaxini	KE	TN	KA	GO	MH	GU
83. Polyura athamas *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
84. Polyura agraria	Yes + R	Yes - R	Yes + C	Yes + C	Yes + R	No
85. Polyura schreiber	Yes - R	Yes - R	Yes - R	Yes - R	Yes - R	No
86. Charaxes bernardus *	Yes + C	Yes - R	Yes + C	Yes + C	Yes - R	Yes - R
87. Charaxes solon *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R
Charaxini: 5	5	5	5	5	5	3
Charaxinae: 5	5	5	5	5	5	3

* Sri Lanka: Charaxinae: 3 species.

Table I. 9. NYMPHALIDAE: Heliconiinae: Acraeini

Species	States					
Heliconiinae: Acraeini	KE	TN	KA	GO	MH	GU
88. Acraea violae *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
Heliconiinae:Acraeini: 1	1	1	1	1	1	1

* Sri Lanka: Heliconiinae: Acraeini: *Acraea*: 1 species. (Acraeini is regarded as a Tribe here, see Harvey in Nijhut).

Table I. 10. NYMPHALIDAE: Heliconiinae: Heliconiini

Species	States					
Heliconiinae: Heliconiini	KE	TN	KA	GO	MH	GU
89. Cethosia nietneri *	Yes + C	Yes - R	Yes + C	Yes + C	Yes - R	No
90. Vindula erota *	Yes + C	Yes - R	Yes + C	Yes + R	Yes - R	No
Heliconiinae: 2 (1)	2 (1)	2 (1)	2 (1)	2 (1)	2 (1)	No

* Sri Lanka: Heliconiinae: 2 (1) species.

Table I. 11. NYMPHALIDAE: Heliconiinae: Argynnini

Species	States					
Heliconiinae: Argynnini	KE	TN	KA	GO	MH	GU
91. Cupha erymanthis *	Yes + C	Yes - C	Yes + C	Yes + C	Yes - R	No
92. Phalanta phalantha *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R
93. Phalanta alcippe *	Yes - C	Yes - R	Yes - C	Yes - R	No	No
94. Cirrochroa thais *	Yes + C	Yes - C	Yes - C	No	No	No
95. Argyreus hyperbius *	Yes - C	Yes - C	Yes - R	No	Yes - R	Yes - R
Argynini: 5 (1)	5 (1)	5 (1)	5 (1)	3	3	2
Argynnini: 5 (1)	5 (1)	5 (1)	5 (1)	3	3	2

* Sri Lanka: Argynnini: 5 (1) species. (For the revision of Heliconiinae, see Harvey in Nijhut, 1991 below).

Table I. 12. NYMPHALIDAE: Apaturinae

Species	States					
Apaturinae: Apaturini	KE	TN	KA	GO	MH	GU
96. Rohana parisatis *	Yes + C	Yes - C	Yes + C	Yes + C	Yes - R	No
97. Euripus consimilis	Yes + C	Yes - R	Yes + C	Yes + R	Yes - R	No
Apaturinae: 2	2	2	2	2	2	No

* Sri Lanka: Apaturinae: 1 species.

Table I. 13. NYMPHALIDAE: Limenitinae: Neptini

Species	States					
Limenitinae: Neptini	KE	TN	KA	GO	MH	GU
98. Neptis jumbah *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R	Yes - R
99. Neptis hylas *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R
100. Neptis clinia	Yes + R	Yes - R	Yes - R	Yes - R	No	No
101. Neptis nata	Yes - R	Yes - R	Yes - R	Yes - R	No	No
102. Neptis soma	Yes - R	Yes - R	Yes - R	No	No	No
103. Neptis viraja	Yes - R	Yes - R	Yes - R	No	No	No
104. Neptis columella	Yes - R	Yes - R	Yes - R	No	No	No
105. Pantoporia hordonia *	Yes + R	Yes - C	Yes + C	Yes + C	Yes - C	Yes - R
106. Pantoporia sandaka	Yes - R	Yes - R	Yes + R	Yes - R	No	No
Neptini: 9	9	9	9	6	3	3

* Sri Lanka: Neptini: 3 species.

Table I. 14. NYMPHALIDAE: Limenitinae: Limenitini: Parthenini: Euthaliinii: Biblini: Marpesiini

Species	States					
Limenitinae: Limenitini	KE	TN	KA	GO	MH	GU
107. Athyma nefte	Yes - R	Yes - R	Yes - R	No	No	No
108. Athyma selenophora	Yes - R	Yes - R	Yes - R	Yes - R	No	No
109. Athyma ranga	Yes - R	Yes - R	Yes - R	No ?	No	No
110. Athyma perius	Yes + C	Yes - C	Yes + C	Yes + C	Yes - C	Yes - R
111. Limenitis procris *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R
Limenitini: 5	5	5	5	3	2	2
Limenitinae: Parthenini	KE	TN	KA	GO	MH	GU
112. Parthenos sylvia *	Yes + C	Yes - R	Yes + C	Yes - R	No	No
Parthenini: 1	1	1	1	1	No	No
Limenitinae: Euthaliini	KE	TN	KA	GO	MH	GU
113. Tanaecia lepidea	Yes - C	Yes - R	Yes + C	Yes - R	No	No
114. Euthalia telchinia	Yes - R	Yes - R	Yes + R	Yes - R	No	No
115. Euthalia aconthea *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R
116. Euthalia lubentina *	Yes + R	Yes - R	Yes + C	Yes - R	Yes - R	No
117. Euthalia nais *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
118. Dophla evelina *	Yes + C	Yes - C	Yes - C	Yes - C	Yes - R	No
Euthaliini: 6 (1)	6 (1)	6 (1)	6 (1)	6 (1)	4 (1)	2 (1)
Limenitinae: Biblini	KE	TN	KA	GO	MH	GU
119. Byblia ilithyia *	Yes - R	Yes + R	Yes - C	Yes - C	Yes + C	Yes + C
120. Ariadne ariadne *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
121. Ariadne merione *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
Biblini: 3	3	3	3	3	3	3
Limenitinae: Marpesiini	KE	TN	KA	GO	MH	GU
122. Cyrestis thyodamas	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R	Yes - R
Marpesiini: 1	1	1	1	1	1	1
Limenitinae:25 (1)	25 (1)	25 (1)	25 (1)	20 (1)	13 (1)	11(1)

* Sri Lanka: Limenitinae: 15 (1). Neptini: 3 species; Limenitini: 1 species; Parthenini: 1 species; Euthaliini: 4 species; Biblini: 3 species

Table I. 15. NYMPHALIDAE: Libytheinae

Species	States					
Libytheinae: *Libythea*	KE	TN	KA	GO	MH	GU
123. Libythea myrrha *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R
124. Libythea lepita *	Yes + C	Yes - C	Yes - C	No	No	No
Libytheinae: 2	2	2	2	1	1	1

* Sri Lanka: Libytheinae: 2 species

Table I. 16. NYMPHALIDAE: Nymphalinae: Nymphalini

Species	States					
Nymphalinae: Nymphalini	KE	TN	KA	GO	MH	GU
125. Junonia hierta *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
126. Junonia orithya *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
127. Junonia lemonias *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
128. Junonia almana *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
129. Junonia atlites *	Yes - C	Yes - R	Yes + C	Yes - R	Yes - R	No
130. Junonia iphita *	Yes + C	Yes - C	Yes + C	Yes + C	Yes - C	Yes - R
131. Cynthia cardui *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
132. Vanessa indica *	Yes - C	Yes - C	Yes - R	No	No	No
133. Kaniska canace *	Yes - R	Yes - R	Yes - R	No	No	No
134. Hypolimnas bolina *	Yes + C	Yes - C	Yes + C	Yes + C	Yes - C	Yes - C
135. Hypolimnas misippus *	Yes + C	Yes - C	Yes + C	Yes + C	Yes - C	Yes - C
136. Doleschallia bisaltide *	Yes - R	Yes - R	Yes - R	Yes - R	Yes - R	No
137. Kallima horsfieldi	Yes + C	Yes - C	Yes + C	Yes + C	Yes - C	Yes - R
138. Kallima inachus	No	No	No	No	Yes - R	Yes - R
Nymphalini: 14 (1)	13 (1)	13 (1)	13 (1)	11 (1)	12 (1)	10 (1)
Nymphalinae 14 (1)	13 (1)	13 (1)	13 (1)	11 (1)	12 (1)	10 (1)

* Sri Lanka: Nymphalinae: 13 (1) species (including the endemic species ***8. Kallima phillarchus***)

Table I. 17. NYMPHALIDAE: Danainae: Danaini: Euploeini.

Species	States					
Danainae: Danaini	KE	TN	KA	GO	MH	GU
139. Parantica aglea *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
140. Parantica nilgiriensis	Yes - C	Yes - C	Yes - R	No	No	No
141. Tirumala limniace *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
142. Tirumala septentrionis *	Yes + C	Yes - C	Yes + C	Yes + C	Yes - C	Yes - R
143. Danaus chrysippus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
144. Danaus genutia *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
Danaini: 6 (1)	6 (1)	6 (1)	6 (1)	5	5	5
Danainae: Euploeini	KE	TN	KA	GO	MH	GU
145. Euploea core *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
146. Euploea sylvester *	Yes - C	Yes - C	Yes - C	Yes - R	Yes - R	No
147. Euploea klugii *	Yes + R	Yes - R	Yes - C	No	No	No
148. Idea malabarica	Yes - C	Yes - R	Yes + C	Yes - R	No	No
Euploeini: 4 (1)	4 (1)	4 (1)	4 (1)	3 (1)	2	1
Danainae: 10 (2)	10 (2)	10 (2)	10 (2)	8 (1)	7	6
NYMPHALIDAE 96 (20)	**95 (20)**	**94 (19)**	**92 (17)**	**70 (8)**	**59 (5)**	**41 (2)**

* Sri Lanka: **Danainae: 12 (2) species** (these include ***9. Parantica taprobana***, ***10. Idea iasonia***, *Euploea phaenareta*, and *Ideopsis similis*. The genus *Ideopsis* does not occur in peninsular India, but is present in the Great Nicobar island, extending southwards to Sumatra and eastwards to Burma and the Sunda Islands. **NYMPHALIDAE in Sri Lanka: 71 (12)**. *Euploea mulciber* from the northern Eastern Ghats (north of the Godavari River) does not occur on the Western Ghats.

Table I. 18. LYCAENIDAE: Riodininae: Riodiniini

Species	States					
Riodininae: Riodiniini	KE	TN	KA	GO	MH	GU
149. Abisara echerius *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
Riodininae 1	1	1	1	1	1	1

* Sri Lanka: Riodininae: 1 species. (Some authors treat this group as a family, but I prefer to keep as a subfamily in this until the entire group is reviewed along with the Lycaenidae and other related groups)

Table I. 19. LYCAENIDAE: Miletinae: Spalgini: Miletini

Species	States					
Miletinae: Spalgini	KE	TN	KA	GO	MH	GU
150. Spalgis epius *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - C
Spalgini: 1	1	1	1	1	1	1
Miletinae: Miletini	KE	TN	KA	GO	MH	GU
151. Logania distanti	No	No	Yes - R	No	No	No
Miletini: 1	No	No	1	No	No	No
Miletinae: 2	1	1	2	1	1	1

* Sri Lanka: Miletinae: 1 Species. A single male of *151. Logania distanti* was found on the Biligirirangan Hills (personal observation, 1994). Another male collected by A. E. G. Best (1977) in the southern Eastern Ghats (from the Nagalapuram Hills) is in the Natural History Museum, London. There is no doubt that the species occurs even further westwards. *Miletus biggsii* was included in Evans, 1932 and Wynter-Blyth, 1957 (as *Gerydus biggsii*) as occurring in Coorg. This was a misidentification. I have not seen any specimens from the Western Ghats.

Only one specimen collected by Best 1, and Mikri. Biligiriranga Hills.

Miletus biggsi from Coorg add.

Table I. 20. LYCAENIDAE: Polyommatinae: Polyommatini

Species	States					
Polyommatini	KE	TN	KA	GO	MH	GU
152. Castalius rosimon *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
153. Caleta caleta *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
154. Discolampa ethion *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - C
155. Tarucus ananda	Yes + C	Yes - C	Yes + C	Yes - C	Yes - C	No
156. Tarucus nara *	Yes + C	Yes + C	Yes + C	No	No	No
157. Tarucus callinara	Yes - R	Yes - R	Yes - R	Yes - R	Yes - R	Yes - R
158. Tarucus balkanica	No	No	No	No	Yes - R	Yes - R
159. Tarucus indica	No	Yes - R	Yes - R	No	Yes - R	Yes - R
160. Leptotes plinius *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
161. Azanus ubaldus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
162. Azanus uranus	Yes - R	Yes - C	Yes - C	Yes - C	Yes + C	Yes + C
163. Azanus jesous *	Yes - C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
164. Everes lacturnus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
165. Udara akasa *	Yes - C	Yes - C	Yes - C	No	No	No
166. Udara singalensis *	Yes - R	Yes - R	No	No	No	No
167. Acytolepis puspa *	Yes - C	Yes - C	Yes - C	Yes - C	Yes - C	Yes - R
168. Acytolepis lilacea *	Yes - C	Yes - R	Yes - R	No	No	No
169. Celatoxia albidisca	Yes - C	Yes - C	Yes - R	No	No	No
170. Celastrina lavendularis *	Yes - C	Yes - C	Yes - C	No	No	No
171. Neopithecops zalmora *	Yes - C	Yes - C	Yes - C	Yes - C	No	No
172. Megisba malaya *	Yes + C	Yes - C	Yes + C	Yes + C	Yes - R	No
*173. Pseudozizeeria maha**	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
174. Zizeeria karsandra *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
175. Zizina otis *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
176. Zizula hylax *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
Polyommatini (in part): 25 (4)	23 (3)	24 (4)	23 (3)	17	18 (1)	16 (1)

* Sri Lanka: Polyommatini (in part): 19 (4) species. (***11. Udara lanka*** is endemic to Sri Lanka). *158. Tarucus balkanica* was found both in Maharashtra (west of Bhimashankar) and in Gujarat (north of Baroda) (personal observation). ***166. Udara singalensis*** is present on the western slopes of the Nilgiris. Specimens from the Nilgiris are also present in the Zoological Survey of India Collection in Calcutta.

add T. theophrastus Fab. Gujarat

Indonesia.

166: Ceylon – the Nilgiris – Indonesia (Singapore)
(remove bold!)

99 T. balcanica

10 T. india

Table I. 21. LYCAENIDAE: Polyommatinae: Polyommatini (continued): Lycaenesthini

Species	States					
Polyommatinae: Polyommatini	KE	TN	KA	GO	MH	GU
177. Chilades laius *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
178. Chilades parrhasius *	Yes - C	Yes - C	Yes - C	Yes - C	Yes + C	Yes + C
179. Chilades pandava *	Yes - C	Yes - C	Yes - C	Yes - C	Yes - C	Yes - C
180. Freyeria putli *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
181. Euchrysops cnejus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
182. Catochrysops strabo *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
183. Catochrysops panormus *	No	Yes - R	Yes - R	No	No	No
184. Lampides boeticus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
185. Jamides bochus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
186. Jamides celeno *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R
187. Jamides alecto *	Yes + C	Yes - C	Yes + C	No	No	No
188. Nacaduba pactolus *	Yes - C	Yes - R	Yes + R	Yes - C	Yes - R	No
189. Nacaduba hermus *	Yes + C	Yes - R	Yes + C	Yes + C	Yes + C	Yes - C
190. Nacaduba kurava *	Yes - R	Yes + C	Yes + C	Yes + C	Yes - C	Yes - C
191. Nacaduba calauria *	Yes + C	Yes - R	Yes - R	No	No	No
192. Nacaduba beroe *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	No
193. Nacaduba berenice *	Yes + C	Yes + C	Yes + C	No	Yes - R	No
194. Ionolyce helicon *	Yes + C	Yes - R	Yes - R	No	No	No
195. Prosotas nora *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
196. Prosotas dubiosa *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
197. Prosotas noreia *	Yes - R	Yes - R	Yes - R	No	No	No
198. Petrelaea dana *	Yes + C	Yes - C	Yes + C	Yes - C	Yes - C	Yes - R
199. Talicada nyseus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
Polyommatini: 48 (4)	45 (3)	47 (4)	46 (3)	34	36 (1)	31 (1)
Polyommatinae: Lycaenesthini	KE	TN	KA	GO	MH	GU
200. Anthene emolus	Yes + C	Yes - C	Yes + C	Yes - C	Yes - R	No
201. Anthene lycaenina *	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R	Yes - R
Lycaenesthini: 2	2	2	2	2	2	1
Polyommatinae: 50(4)	**47 (3)**	**49 (4)**	**48 (3)**	**36**	**38 (1)**	**32 (1)**

* Sri Lanka: Polyommatinae: Polyommatini: 45 (7) species; ***12. Jamides coruscans***, ***13. Jamides lacteata***, ***14. Nacaduba sinhala*** and ***15. Nacaduba ollyetti*** are endemic Polyommatini in Sri Lanka; Lycaenesthini: 1 species. Polyommatinae in Sri Lanka: 46 (7) species. *180. Freyeria putli* and *F. trochylus* (traditionally applied to south Indian populations) are distinct from each other, they occur sympatrically on the Himalaya, the former is the valid name for the south Indian species (see Fujioka, 1970). The latter might occur on the northern Western Ghats.

Nacaduba sinhala
♀ Sri Lanka
♂ Sri Lanka

One ♂ specimen BM. 1928-112
Tinnevelly
Kodanadu. 29A-115
Collected by H. Latham

Table I. 22. LYCAENIDAE: Theclinae: Arhopalini: Amblypodiini: Aphnaeini: Catapaecilmatini

Species	States					
Theclinae: Arhopalini	KE	TN	KA	GO	MH	GU
202. Arhopala pseudocentaurus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R	Yes - R
203. Arhopala amantes *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
204. Arhopala alea	Yes + C	Yes - C	Yes + C	Yes - R	No	No
205. Arhopala bazaloides *	Yes + C	Yes - R	Yes + C	Yes - R	No	No
206. Arhopala atrax	No (?)	Yes - R	Yes + R	No (?)	Yes - R Yes	No Yes
207. Arhopala abseus *	Yes - R	Yes - R	Yes - R	No (?)	Yes - R	No
208. Thaduka multicaudata	Yes + C	Yes - C	Yes + C	Yes - C	Yes - R	No
209. Surendra quercetorum *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R
210. Zinaspa todara	Yes - C	Yes - R	Yes - C	Yes - R	No	No
Arhopalini: 9 (2)	8 (2)	9 (2)	9 (2)	7 (2)	6	3
Theclinae: Amblypodiini	KE	TN	KA	GO	MH	GU
211. Iraota timoleon *	Yes + C	Yes - C	Yes + C	Yes + R	Yes - C	Yes - C
212. Amblypodia anita *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R
Amblypodiini : 2	2	2	2	2	2	2
Theclinae: Aphnaeini	KE	TN	KA	GO	MH	GU
213. Spindasis vulcanus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
214. Spindasis schistacea *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
215 Spindasis ictis *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
216. Spindasis elima *	Yes - C	Yes - C	Yes + C	Yes + C	Yes + C	Yes + C
217. Spindasis abnormis	Yes - R	Yes - R	Yes - C	No(?)	Yes - R	No
218. Spindasis lohita *	Yes + C	Yes - R	Yes + C	Yes + C	Yes - R	No
219. Apharitis lilacinus	No	No	Yes - C	No(?)	Yes - R	Yes - C
220. Apharitis acamas	No	No	No	No(?)	No (?)	Yes - R
Aphnaeini: 8 (3)	6 (3)	6 (3)	7 (3)	5 (2)	7 (2)	6 (2)
Theclinae:Catapaecilmatini	KE	TN	KA	GO	MH	GU
221. Catapaecilma major *	Yes - R	Yes - R	Yes - R	Yes - R	Yes - R	No
Catapaecilmatini: 1	1	1	1	1	1	No
Theclinae (in part) 20 (5)	17 (5)	18 (5)	19 (5)	15 (3)	16 (2)	11 (2)

* Sri Lanka: Theclinae (in part): 17 (5): Arhopalini: 6 (1) species. ***16. Arhopala ormistoni*** is endemic to Sri Lanka. Ambypodiini: 2 species; Aphnaeini: 7 (4) species, ***17. Spindasis nubilus*** and ***18. Spindasis greeni*** are endemic to Sri Lanka; Catapaecilmatini: 1 species. *206. Arhopala atrax* was found in the Someshwar Sanctuary in South Kanara, near Kumta in North Kanara (Karnataka) and near Gudalur in the Nilgiri District (Tamil Nadu) (personal observations).

Table I. 23. LYCAENIDAE: Theclinae: Loxurini: Cheritrini: Horagini: Zesiini: Iolaini

Species	States					
Theclinae: Loxurini	KE	TN	KA	GO	MH	GU
222. Loxura atymnus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	No
Loxurini: 1	1	1	1	1	1	No
Theclinae: Cheritrini	KE	TN	KA	GO	MH	GU
223. Cheritra freja *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R	No
Cheritrini: 1	1	1	1	1	1	No
Theclinae: Horagini	KE	TN	KA	GO	MH	GU
224. Rathinda amor *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	No (?)
*225. Horaga onyx**	Yes - C	Yes - C	Yes - C	Yes - C	Yes - C	No
226. Horaga viola *	Yes - R	Yes - R	Yes + C	Yes - R	No	No
Horagini: 3	3	3	3	3	2	No
Theclinae: Zesiini	KE	TN	KA	GO	MH	GU
227. Zesius chrysomallus *	Yes - R	Yes - R	Yes + R	Yes + R	Yes - R	No (?)
Zesiini: 1 (1)	1 (1)	1 (1)	1 (1)	1 (1)	1 (1)	No
Theclinae: Iolaini	KE	TN	KA	GO	MH	GU
228. Ancema blanka	Yes - C	Yes - C	Yes + C	Yes + C	Yes - C	No
229. Creon cleobis	Yes - C	Yes - C	Yes - C	Yes - R	No	No
230. Pratapa deva *	Yes + C	Yes - C	Yes + C	Yes - R	Yes - R	No (?)
231. Tajuria cippus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R
232. Tajuria maculata	No (?)	Yes - R	Yes - R	No	No	No
233. Tajuria jehana *	Yes - C	Yes - C	Yes - C	Yes - C	No (?)	No
234. Tajuria melastigma	Yes - C	Yes - C	Yes - C	Yes - R	No	No
235. Eliotia jalindra	Yes - R	Yes - R	Yes + C	Yes - R	No	No
Iolaini: 8 (1)	7 (1)	8 (1)	8 (1)	7 (1)	3	1
Theclinae (in part): 14 (2)	13 (2)	14 (2)	14 (2)	13 (2)	8 (1)	1

* Sri Lanka: Theclinae (in part): 9 (2) species: Loxurini: 1; Cheritrini: 1; Horagini: 3; Zesiini: 1 (1); Iolaini: 3 (1).

The monotypic genus *227. Zesius* is endemic to the Indian region. *235. Eliotia* Hayashi is (just) senior to *Rachana* Eliot.

Table I. 24. LYCAENIDAE: Theclinae (continued): Hypolycaenini: Deudorigini

Species	States					
Theclinae: Hypolycaenini	KE	TN	KA	GO	MH	GU
236. Hypolycaena nilgirica *	Yes - C	Yes - C	Yes - C	No	No	No
237. Hypolycaena othona	Yes - C	Yes - C	Yes - C	Yes - C	Yes - R	No
238. Zeltus amasa	Yes + C	Yes - R	Yes + C	Yes - R	No (?)	No
Hypolycaenini: 3 (1)	3 (1)	3 (1)	3 (1)	2	1	No
Theclinae: Deudorigini	KE	TN	KA	GO	MH	GU
239. Deudorix epijarbas *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
240. Deudorix isocrates *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
241. Deudorix perse *	Yes + C	Yes - C	Yes + C	Yes + C	Yes - C	No
242. Bindahara phocides *	Yes + C	Yes - R	Yes + C	Yes + C	No	No
243. Rapala iarbus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
244. Rapala lankana *	Yes - R	Yes - R	Yes - C	No	No	No
245. Rapala manea *	Yes + C	Yes - C	Yes + C	Yes + C	Yes - C	Yes - R
246. Rapala varuna *	Yes - C	Yes - R	Yes + C	Yes - C	Yes - R	No
Deudorigini: 8 (1)	8 (1)	8 (1)	8 (1)	7	6	4
Theclinae:45(9)	41 (8)	43 (9)	44 (9)	37 (6)	30 (3)	16 (2)

* Sri Lanka: Hypolycaenini: 1 (1) species; Deudorigini: 8 (1) species. **Theclinae: 34 (9) species.**

Table I. 25. LYCAENIDAE: Curetinae: *Curetis*

Species	States					
Curetinae: *Curetis*	KE	TN	KA	GO	MH	GU
247. Curetis thetis *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - C
248. Curetis acuta	Yes - C	Yes - C	Yes + C	Yes - R	No	No
249. Curetis siva	Yes - R	Yes - R	Yes + C	Yes - R	No	No
Curetinae: 3 (2)	3 (2)	3 (2)	3 (2)	3 (2)	1	1
LYCAENIDAE:101 (15)	**93 (13)**	**97 (15)**	**98(14)**	**78 (8)**	**71 (5)**	**51 (2)**

* Sri Lanka: Curetinae: 1 (1) species; **LYCAENIDAE: 83 (17) Species.**

This should be Zeltus etolus Fab, 1793

Original description:

Papilio etolus Fab. 1787 : II : 66 · 620

Hesperia etolus Fab. 1793 : III · I : 264 · 20

TL : S India : TS : ZMUC

Check in Evans! : dentata dentata Moore.

Bibasis oedipodea (was recorded in Annamalais ! Munnar)
Sarangesa sati de Nicéville, 1891. TL: Deesa, Rajputana!
ENDEMIC! to INDIA!!

start from 7

Table I. 26. HESPERIOIDEA: HESPERIIDAE: Coeliadinae

Species	States					
Coeliadinae	KE	TN	KA	GO	MH	GU
250. Bibasis jaina	Yes + C	Yes - C	Yes + C	Yes - R	No	No
251. Bibasis gomata	Yes - C	Yes - R	Yes + C	Yes + R	No	No
252. Bibasis sena *	Yes + R	Yes - R	Yes + R	Yes + R	No	No
253. Hasora chromus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes+ C	Yes - C
254. Hasora taminatus *	Yes + C	Yes + C	Yes + C	No	No	No
255. Hasora badra *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R
256. Hasora vitta	Yes - R	No	Yes - C	Yes - C	No	No
*257. Badamia exclamationis**	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
258. Choaspes benjaminii *	Yes - C	Yes - C	Yes - C	No	No	No
Coeliadinae: 9	9	8	9	7	3	3

* Sri Lanka: Coeliadinae: 7 species. *Bibasis oedipodea* is present in Sri Lanka, but so far not found in south India. I have retained *Bibasis* Moore, 1881 instead of *Burara* Swinhoe, 1893 for these species groups

(30-1) ♀♂ SL.

17(♀)

Table I. 27. HESPERIIDAE: Pyrginae

Species	States					
Pyrginae	KE	TN	KA	GO	MH	GU
259. Celaenorrhinus leucocera	Yes + C	Yes - C	Yes + C	Yes + C	Yes + C	Yes - C
260. Celaenorrhinus ambareesa	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
261. Celaenorrhinus ruficornis	Yes + C	Yes - C	Yes + C	Yes - C	No (?)	No
262. Tagiades japetus *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
263. Tagiades gana	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R
264. Tagiades litigiosa *	Yes + C	Yes - C	Yes + C	Yes + C	Yes + C	Yes - C
265. Gerosis bhagava	Yes + C	Yes - R	Yes + C	Yes - R	No	No
266. Pseudocoladenia dan	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
267. Coladenia indrani *	Yes + C	Yes - R	Yes + C	Yes - R	No	No
268. Sarangesa dasahara *	Yes - C	Yes - C	Yes + C	Yes + C	Yes + C	Yes + C
269. Sarangesa purendra	Yes - R	Yes - R	Yes + C	Yes + C	Yes + C	Yes + C
270. Tapena thwaitesi *	Yes + R	Yes - R	Yes + C	Yes + C	Yes - C	No
271. Odontoptilum angulata	Yes - C	Yes - C	Yes + C	Yes + C	Yes - C	Yes - C
272. Odontoptilum ransonnetti *	Yes + C	Yes - C	Yes + C	Yes - C	No (?)	No
273. Caprona alida *	Yes - C	Yes - C	Yes - C	No	No	No
274. Caprona agama	No (?)	Yes - R	Yes - R	No	No	No
275. Gomalia elma *	No (?)	Yes - R	Yes - C	Yes - C	Yes + C	Yes + C
276. Spialia galba *	Yes + R	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
Pyrginae : 18 (1)	16 (1)	18 (1)	18 (1)	16 (1)	12 (1)	11(1)

* Sri Lanka: Pyrginae: 10 (1) species. (***19. Celaenorrhinus spilothyrus*** is an endemic Pyrginae in Sri Lanka).

ADD. ♀♂ illustrated from SL. (recorded in Cardamom Hills (wiki). Originaley described from between Metupalayam & Coonoor.
See the Fabrician taxa Hesperia altius (ZMUC) from South India.

299: ♂♀ (Coorg) (36-91)*
300: ♂♀ (Kanara) (36-90)
301: ♀♂ (Coorg (36-91)

302: ♀ (Karwar) ♀ Coorg (36-101)
303: ♂ (Assam) (36-106)
304: ♀♂ (Karwar) (36-111)
305: ♂♀ (Karwar) (39 36-63)
306: ♀ (Palni) ♂ (Nilgiri) (39-64)

Table I. 28. HESPERIIDAE: Hesperiinae

Species	States					
Hesperiinae	KE	TN	KA	GO	MH	GU
277. Aeromachus pygmaeus	Yes - C	Yes - C	Yes + C	Yes - R	No	No
278. Aeromachus dubius	Yes - R	Yes - R	Yes - C	No	No	No
279. Ampittia dioscorides *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
280. Halpe homolea *	Yes + C	Yes - C	Yes + C	Yes + C	Yes - R	No
281. Halpe porus	Yes + C	Yes + C	Yes + C	No	No	No
282. Sovia hyrtacus	Yes - C	Yes - C	Yes - C	Yes - C	No	No
283. Thoressa honorei	Yes - C	Yes - C	Yes - C	Yes - R	No	No
284. Thoressa astigmata	Yes + C	Yes - R	Yes + C	Yes - R	No	No
285. Thoressa sitala	Yes - R	Yes - R	Yes - R	No (?)	No	No
286. Thoressa evershedi	Yes - R	Yes - R	Yes - R	No	No	No
287. Iambrix salsala *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R	No
288. Psolos fuligo	Yes - C	Yes - R	Yes - C	No	No	No
*289. Notocrypta paralysos**	Yes - C	Yes - C	Yes + C	Yes - R	Yes - R	No
290. Notocrypta curvifascia *	Yes + C	Yes - R	Yes + C	Yes - C	Yes - R	No
291. Salanoemia sala	Yes - R	No	Yes - R	No (?)	No	No
292. Udaspes folus *	Yes - C	Yes - C	Yes - C	Yes - C	Yes - C	Yes - C
293. Arnetta mercara	Yes - C	Yes - R	Yes + C	No	No	No
294. Arnetta vindhiana	Yes - C	Yes - C	Yes + C	Yes + C	Yes + C	Yes - C
295. Suastus gremius *	Yes + C	Yes - C	Yes + C	Yes + C	Yes - C	Yes - C
296. Suastus minuta *	Yes - R	Yes - R	Yes - R	No	No	No
297. Cupitha purreea	Yes - R	Yes - R	Yes - R	No	No	No
298. Baracus vittatus *	Yes - C	Yes - C	Yes + C	Yes - C	No	No
299. Hyarotis microsticta	Yes - R	Yes - R	Yes - C	Yes - R	No	No
300. Hyarotis adrastus *	Yes - C	Yes - R	Yes + C	Yes - R	No	No
301. Quedara basiflava	Yes - R	Yes - R	Yes - R	No	No	No
302. Gangara thyrsis *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R
303. Erionota thrax	Yes - R	No (?)	Yes - R	No	No	No
304. Matapa aria *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - R
305. Taractrocera maevius *	Yes - C	Yes - C	Yes - C	Yes - C	Yes - C	Yes - C
306. Taractrocera ceramas	Yes + C	Yes - C	Yes + C	Yes + C	Yes - C	No
307. Oriens concinna	Yes - R	Yes - R	Yes - R	No	No	No
308. Oriens goloides *	Yes - C	Yes - R	Yes - R	No	No	No
309. Potanthus pallida *	Yes - R	Yes - R	Yes - R	No	No	No
310. Potanthus pseudomaesa *	Yes - C	Yes - C	Yes - C	Yes - C	Yes - C	Yes - C
311. Potanthus confucius *	Yes - R	Yes - R	Yes - R	No (?)	Yes - R	No
312. Potanthus pava	Yes - R	Yes - R	Yes - R	No	No	No
313. Potanthus palnia	Yes + C	Yes - C	Yes - C	No	No	No
Hesperiinae (in part):37(10)	37 (10)	35 (10)	37 (10)	20 (5)	14 (1)	8 (1)

* Sri Lanka: Hesperiinae (in part): 18 species. *Gangara lebadea* is present in Sri Lanka, but absent (?) on the Western Ghats.

Hesperiinae continued in the next Table I. 29.

285 (No ♂ ♀)?

50 ♂ ♂

Evans, 1914

(36-104 ♂ ♀)

53 ♂ ♀ 53 ♂

vittatus Felder, 1862 (TL: SL) ♂
subditus Moore, 1883 (TL: Nilgiris) ♀
hampsoni Elwes & Edwards (TL: Karwar) ♂
gotha Evans, 1949 (TL: Annamalais ♀): Synonym of ♂

Kerala (Wilgi) (Orissa) (Andhra Pradesh)

307: ♀ (Nilgiris) ♂ (Coorg) (39-69)
308: ♀ ♂ (Karwar) (39-70)

PTO!

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Table I. 29. HESPERIIDAE:

Species						
Hesperiinae						
314. Telicota colon *						
315. Telicota ancilla *						
316. Parnara bada *						
317. Gegenes nostrodamus						
318. Borbo cinnara *						
319. Borbo bevani						
320. Pelopidas agna *						
321. Pelopidas subochracea *	Yes - C	Yes - R	Yes + C	Yes - R	No	No
322. Pelopidas mathias *	Yes - C	Yes - C	Yes - C	Yes + C	Yes + C	Yes + C
323. Pelopidas conjuncta *	Yes - C	Yes - C	Yes + C	Yes + R	Yes - C	Yes - R
324. Pelopidas assamensis	No	No	No	No	Yes - R	No
325. Pelopidas thrax	No	No	No	No	No (?)	Yes - R
326. Polytremis lubricans	Yes + C	Yes - R	Yes + C	No	No	No
327. Baoris farri	Yes + C	Yes - C	Yes + C	Yes - R	No	No
328. Caltoris kumara *	Yes + C	Yes + C	Yes + C	Yes + C	No	No
329. Caltoris canaraica	Yes - R	Yes - R	Yes + C	Yes - R	No(?)	No
330. Caltoris philippina *	Yes - R	Yes - R	Yes + C	Yes - C	Yes- R	No
Hesperiinae: 54 (11)	51 (11)	49 (11)	51 (11)	33 (6)	25 (1)	18 (1)
HESPERIIDAE: 81 (12)	**76 (12)**	**75 (12)**	**78 (12)**	**56 (7)**	**40 (2)**	**32 (2)**

* Sri Lanka: Hesperiinae:30 (2) species. 2 species of Hesperiinae, ***20. Thoressa decorata*** and ***21. Baoris penicillata*** are endemic to Sri Lanka. **HESPERIIDAE: 48 (3) species**. *324. Pelopidas thrax*, an unmistakable species, was found on the Ajanta Hills (Maharashtra, personal observation), and in Gujarat (Mt. Abu area, also personal observation) and could turn up anywhere in the northern Western Ghats. The Tribal classification of this Family is still in a flux, therefore no tribal distinctions are introduced in this study.

P. bada bada Moore.

Gegenes pumilo Hoffmannsegg 1804 (Napoli, Italy)

329: ♀♂ (Karwar)

330: Microsticta ♀ 74F

318: Wallace.

ADD: Parnara ganga Evans, 1937b
Coorg. (40-6) (♂ Coorg ♀ Jabalpur)

87 Ozigga'a

Conjuncta

Table I. 29. HESPERIIDAE: Hesperiinae (continued):

Species	States					
Hesperiinae	KE	TN	KA	GO	MH	GU
314. Telicota colon *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C
315. Telicota ancilla *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - R
316. Parnara bada *	Yes - C	Yes - C	Yes + C	Yes + C	Yes + C	Yes - C
317. Gegenes nostrodamus	No	No	No	No	Yes - R	Yes - R
318. Borbo cinnara *	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C	Yes + C
319. Borbo bevani	Yes - C	Yes - R	Yes + C	Yes - C	Yes - R	Yes - R
320. Pelopidas agna *	Yes + C	Yes + C	Yes + C	Yes + C	Yes - C	Yes - C
321. Pelopidas subochracea *	Yes - C	Yes - R	Yes + C	Yes - R	No	No
322. Pelopidas mathias *	Yes - C	Yes - C	Yes - C	Yes + C	Yes + C	Yes + C
323. Pelopidas conjuncta *	Yes - C	Yes - C	Yes + C	Yes + R	Yes - C	Yes - R
324. Pelopidas assamensis	No	No	No	No	Yes - R	No
325. Pelopidas thrax	No	No	No	No	No (?)	Yes - R
326. Polytremis lubricans	Yes + C	Yes - R	Yes + C	No	No	No
327. Baoris farri	Yes + C	Yes - C	Yes + C	Yes - R	No	No
328. Caltoris kumara *	Yes + C	Yes + C	Yes + C	Yes + C	No	No
329. Caltoris canaraica	Yes - R	Yes - R	Yes + C	Yes - R	No(?)	No
330. Caltoris philippina *	Yes - R	Yes - R	Yes + C	Yes - C	Yes- R	No
Hesperiinae: 54 (11)	51 (11)	49 (11)	51 (11)	33 (6)	25 (1)	18 (1)
HESPERIIDAE: 81 (12)	**76 (12)**	**75 (12)**	**78 (12)**	**56 (7)**	**40 (2)**	**32 (2)**

* Sri Lanka: Hesperiinae:30 (2) species. 2 species of Hesperiinae, ***20. Thoressa decorata*** and ***21. Baoris penicillata*** are endemic to Sri Lanka. **HESPERIIDAE: 48 (3) species**. *324. Pelopidas thrax*, an unsmistakable species, was found on the Ajanta Hills (Maharashtra, personal observation), and in Gujarat (Mt. Abu area, also personal observation) and could turn up anywhere in the northern Western Ghats. The Tribal classification of this Family is still in a flux, therefore no tribal distinctions are introduced in this study.

Karsana Moore Sinhoe Lep. Ind.

40-45 ♀♂

(40-37) ♂ SL.

(36-53 ♀♂)

P. bada bada Moore.

Gegenes pumilo Hoffmannsegg 1804 (Napoli, Italy)

329: ♀♂ (Karwar) (40-39)

330: Microsticta ♀ 74f

318: Wallace.

316AF

176f

ADD: Parnara ganga Evans, 1937b

Coorg. (40-6) (♂ Coorg ♀ Jabalpur).

316b

Table I. 30. BUTTERFLIES OF THE WESTERN GHATS: PAPILIONIDAE; PIERIDAE; NYMPHALIDAE; LYCAENIDAE; HESPERIIDAE

FAMILIES	STATES					
BUTTERFLY FAMILIES	KE	TN	KA	GO	MH	GU
PAPILIONIDAE: 19 (8)	19 (8)	19 (8)	19 (8)	18 (7)	13 (3)	11(2)
PIERIDAE: 33 (6)	31 (6)	31 (6)	29 (5)	27 (4)	24 (2)	23 (1)
NYMPHALIDAE: 96 (20)	95 (20)	94 (19)	92 (17)	70 (8)	59 (5)	41 (2)
LYCAENIDAE: 101 (15)	93 (13)	97(15)	98 (14)	78 (8)	71 (5)	51 (4)
HESPERIIDAE: 81 (12)	76 (12)	75 (12)	78 (12)	56 (7)	40 (2)	32 (2)
Butterfly species in Western Ghats: 330 (61)	**314 (59)**	**316 (60)**	**316 (56)**	**249 (34)**	**208 (17)**	**158 (11)**

These 330 species are now placed in 166 genera. This constitution will certainly change in the future as more and more groups will be phylogenetically treated than done so far. Only one genus, ***54 Parantirrhoea***, is entirely **endemic** to this mountain Range. Genus ***227 Zesius*** is found in Sri Lanka, Western Ghats and the Himalaya. Note that Kerala should have at least another 4 to 5 species, that are recorded in Tamil Nadu (TN), but so far not recorded within the former State. Karnataka, Goa and Maharashtra will also increase their species numbers, once the study becomes more intensive and systematic.

TABLE I. 31. BUTTERFLIES OF THE WESTERN GHATS AND SRI LANKA

BUTTERFLY FAMILIES	FAUNAL CENTRES (HOT SPOTS)	
DIVERSITY OF BUTTERFLIES	WESTERN GHATS	SRI LANKA
PAPILIONIDAE	**19 (8) (5)**	**15 (5) (2)**
PIERIDAE	**33 (6) (3)**	**27 (5) (1)**
NYMPHALIDAE	**96 (20) (12)**	**71 (12) (7)**
LYCAENIDAE	**101 (15) (5)**	**83 (17) (8)** (14)
HESPERIIDAE	**81 (12) (12)**	**48 (3) (3)**
BUTTERFLY SPECIES	**330 (61) (37)**	**244 (41) (21)**

Note that numbers in the first pair of brackets are shared endemics of the Indian region between the Western Ghats and Sri Lanka, in the second pair of brackets are numbers of narrow endemics confined within these areas. 37 species occur only on the Western Ghats and adjacent areas, and are strictly **endemic** species to this mountain range, which is more than ten per cent. 21 species are strictly **endemic** to Sri Lanka, that is less than ten percent. he rest are common endemics between these two regions. See comparison with the butterfly fauna of the Indian region in Figure 3 above and Table I. 32 below.

Table I. 32. BUTTERFLIES OF THE WORLD; THE INDIAN REGION; THE WESTERN GHATS; AND SRI LANKA

BUTTERFLIES OF THE WORLD	INDIAN REGION	WESTERN GHATS	SRI LANKA
PAPILIONIDAE: 573	107 114	19	15
PIERIDAE : 1200	109 112	33	27
NYMPHALIDAE: 6000	521	96	71
LYCAENIDAE: 6000	443	101	81
HESPERIIDAE: 3050	321	81	48
TOTAL SPECIES: 16823	1501	330 +4	244 +[1]?

Estimations of world numbers of butterflies are taken from Scoble (1992). However, the actual number of species may be upwards of 18000 plus species, (R. I. Vane-Wright, personal communication). Total numbers for the Indian region (exclusive of southern Burma) is my own estimation (Gaonkar, in prep). However, another hundred plus species will turn out in the north eastern region, when that area is far more extensively explored. It is also possible that in some families like Nymphalidae, Lycaenidae and Hesperiidae, undescribed species may still be found in museum cabinets. For the Western Ghats, another ten species may be added when Lycaenidae and Hesperiidae are worked out more thoroughly than done so far by me. Sri Lankan fauna is far better known, and it is unlikely that many more species will be found there. As noted above, the Nymphalidae here includes Danainae and Satyrinae, two groups regarded as separate families by many writers. All modern systematists (since Ehrlich, 1958, Kristensen, 1976 and de Jong *et al.*, 1996) have treated these two groups as subfamilies (see below under Systematic Works). The Lycaenidae in this study includes Riodininae.

Annotated References

Source materials for the study of the Butterflies of the Western Ghats.

While studying the ditribution and status of the butterflies of the Western Ghats, I have studied practically all relevant sources that are available on this mountain range, the Indian region and adjacent areas. They include, apart from the following works of direct relevance, works on butterfly biology, ecology and systematics. They are too numerous, and in many different languages other than English, to be included here. They are all listed in my Annotated Bibliography (Gaonkar, in prep.). However, major systematic works of reference are listed below to assist further study. I have also included major faunistic works from neighbouring countries (and biogeographical areas) for those who wish to compare the faunal diversity. Scientific and popular literature on butterflies (and moths and other groups of insects) now amounts to thousands of books and papers. The source materials are described under the following four sections, with brief introductions and annotations to each entries.

1. Museum Collections. 2. Faunistic Works.

3. Local Check-Lists. 4. Works on Butterfly Systematics.

Rich.

1. Museum Collections

Enormous numbers of specimens of butterflies from this region have been deposited in various museum collections around the world since the very first description of Indian butterflies by J. C. Fabricius in 1775 (most Fabrician types from the Indian region are now housed in the Zoological Museum in Copenhagen. See Gaonkar, in prep.). Unfortunately, no museum collection in India is anywhere near complete. Even if some of them have fairly comprehensive collections, like the Bombay Natural History Society, many species are represented only by a few specimens, and many are badly damaged, beyond recognition. This makes the precise identification, in these collections, of difficult groups like Lycaenidae, Hesperiidae and Satyrinae very difficult for students. So, they are not as up-to-date as one would wish for the identification of Indian butterfly biodiversity, or for that matter, Indian insect biodiversity. National and local assessments of insect biodiversity cannot be done without comprehensive museum reference collections.

Collecting butterflies and other insects for study ("biodiversity monitoring" in the real sense) is not at all encouraged in India. On the contrary, it is positively discouraged by conservation movements, environmental groups, many scientists, and generally by most people interested in the natural world. This has been (and still is) positively *harmful* for the promotion of faunistic entomology and systematic biology in general in India, since many insect groups, including butterflies and moths, are still very poorly known or even collected (sampled). Insects constitute the maximum number of animal species recorded in the world

and from this country and the subcontinent (see E.O.Wilson, 1992. The Diversity of Life). There is a growing band of butterfly "watchers" and "observers", mostly coming from a bird-watching background, who do not understand that only larger, well known, butterfly species can be identified and observed, without netting. Smaller species, belonging to difficult groups like the Nymphalidae, Lycaenidae and Hesperiidae, and even difficult groups of Pieridae, cannot be "observed" and reliably *recognized* until you have them on your palm, or sometimes under a microscope.

Who can "observe" the differences between *Eurema nilgiriensis* and *Eurema andersoni* (both Pieridae found sympatrically on the Nilgiris, Palnis and the Kerala highlands), or *Parantica sita* and *Parantica pedonga* (both Danainae, two closely related Milkweeds, in Sikkim), or even *Freyeria putli* and *Freyeria trochylus* (both Lycaenidae sympatrically flying on the Himalaya), and many other closely related species, by "observation" alone, without netting? *I can not*, even with more than three decades of field experience! Therefore, it seems ironical that it was left to a scientist from far away Japan to identify and describe, recently, a new (and relatively large) species of butterfly (*Eurema nilgiriensis* Yata, 1990; family Pieridae) from museum cabinets. Many recent check-lists (included here under), and unpublished surveys (not included), that have come to my notice, even from biodiversity-rich areas (like the unpublished survey from Silent Valley in Kerala), contain only *a fraction* of the total butterfly fauna of that area. Most such studies mention only common species, which are abundant and ubiquitous everywhere in India. This is because no systematic collecting was done, and field identification, without netting, is extremely difficult.

Apart from some species of butterflies in Europe and some Birdwings in New Guinea, there is no *evidence* that butterfly collecting (actually only sampling) for the purpose of study is harmful to butterfly populations. Commercial collecting (a declining trade) never existed in India on the same scale as it did in Taiwan, Thailand and other south east Asian countries. Even to estimate the density of a species in a given area, one will have to collect them first. What is much more harmful, as everybody will agree, is the enormous disturbance and destruction of their habitats that is taking place all over India. Ethical criteria must be carefully applied when it comes to monitoring (that is collecting data on species) different groups that constitute the rich biodiversity of this country. We no longer have (and perhaps need) to shoot birds and larger mammals for the purpose of study. However, we may still have to net and trap them for the purpose of blood samples for chromosomal and genetic studies (emerging sciences), and also for reconstructing their phylogenies. Everyone who truly understands and appreciates the monumental achievements of the late Sálim Ali on Indian birds, will also agree that he could not have achieved this (and now famous) intimate knowledge, without having *shot* hundreds of them for *scientific research.* We know that he always carried both guns and trapping (mist) nets during his bird surveys. The Bombay Natural History Society houses most of his bird skins. To the horror of many recent "non-violent" ecologists, he not only admitted this fact but also defended it in print.

It appears to me that the ethical standards (of not killing) applied to bird and mammal groups have invaded even the realms of entomology. Amateur entomology does not exist in this country any more. Where would be the science of real Entomology without them?

Nearly all of the specimens collected from this area, that have been deposited during the last two hundred years in The Natural History Museum in London, were collected by *non-professional* naturalists. I need hardly admit that whatever merit this present study may have is largely due to this Museum's magnificent Collection. The poor representation of reference specimens and literature in the museums of this country can be understood from this background. It can be argued (and shown) that the decline of natural history is partly responsible for the biodiversity crisis in this region; this *crisis* is the crisis of knowledge (and lack of it) about the natural world. The more (also non-utilitarian) knowledge one has about different groups of animals and plants, from different biodiversity-rich areas, the better one is equipped for identifying such areas and putting pressure on conservation and protection policies of national and regional governments.

The only museum which has practically a complete collection of butterflies from the Western Ghats and Sri Lanka (with the exception of one or two species) is The Natural History Museum in London. This Museum also has the best series of specimens of each species, from different localities in the Indian region, including the Western Ghats. It also houses the types and general collections of all the authors who wrote the local-check lists and faunistic papers mentioned below (except that of L. de Nicéville, whose collection is housed in the Zoological Survey of India, Calcutta). Along with specimens, this institution also holds practically, *all* of the published literature on the flora and fauna of this region. Besides literature and specimens, this Museum also houses many relevant manuscripts, journals and drawings. The Natural History Museum therefore houses near *total information* on India's (and the subcontinent's) biodiversity. While working out the exact

distributions of species, I have relied upon this magnificent institution's resources. This Museum also houses the famous Lord Walter Rothschild Collection (second only to the Museum's collection in sheer number of species and specimens from the Indian region), which was removed from the Tring Museum and housed in London. In Britain, apart from London, the Oxford University Museum also houses a fairly good collection of Indian insects. In continental Europe, the collection of the Zoological Museum in Copenhagen houses the famous type collection of J. C. Fabricius, who described nearly a thousand species of the earliest known species of insects from India. This collection also houses very good representative specimens of species collected by various people from different parts of India. Very good representative collections of south Indian butterflies (and other insects) are also to be found in Leiden (Holland), Munich and Berlin (Germany), Paris (France) and Japan. In America, the California Academy of Sciences (LA, CA); the US National Museum of Natural History (Washington D. C.); American Museum of Natural History (New York) and some others, also house significant number of specimens from this region.

In India, the collection of the Zoological Survey of India in Calcutta is probably the next best collection. This collection includes the types of Lionel de Nicéville, James Wood-Mason and G. F. L. Marshall from the Western Ghats. This Institution also houses the general collections of these three men, besides those of many others. Unfortunately, during the Second World War, the collection was transferred to Varanasi (Benares) and other places, and part of it was destroyed during the monsoon floods. But these are all very old, and the Zoological Survey has not systematically updated its collection to include every

species found within this region. However, the Survey's regional stations in Poona, Madras and Calicut maintain some collections from the Western Ghats. They are neither comprehensive nor systematic.

The second important collection of south Indian butterflies is housed in the Bombay Natural History Society. However, even this collection is not complete, since it has not been brought up to date to include all species from the Western Ghats. Not all species are represented. This Institution, however, houses a near complete collection of Ormiston's Sri Lankan butterflies, kept as a separate entity. Other minor collections in India, which have some south Indian butterflies, are in the Madras Museum (collections described in Satyamurthi, 1966 but badly maintained) and in the Anglade Institute of Natural History, Shembaganur, Palni Hills, Tamil Nadu (collection catalogued in Matthew, 1994). The Forest Research Institute in Dehra Dun and the Pusa Institute (Indian Council of Agricultural Research, IARI) in Delhi also maintain a collection, and have some butterflies from the Western Ghats and Sri Lanka. However, no collection actually maintains, systematically, any continuity and updates their collections. A detailed history of studies on butterflies of the Indian region is included in my forthcoming monograph (see below).

2. Faunistic Works

As mentioned above, in the post-Linnaean period, the very first butterflies were described from south India by J. C. Fabricius (1775 onwards), and Pieter Cramer (1775 onwards). Only one species from peninsular India was described by Linnaeus (1758) based on

previous descriptions (and illustration). That was *Papilio hector* (now *Pachliopta hector*, see Gaonkar, in prep.). For works of Fabricius and Cramer, see my Annotated Bibliography. However, nearly a century passed before the majority of the butterfly species of the Western Ghats were described and incorporated in monographs dealing with the Indian region. Chronologically, the works dealing with the Indian fauna, which included the fauna of the Western Ghats, are listed below. At the end of this, I also include works which are available on our neighbouring countries and biogeographical regions.

[1828-1829]. Horsfield, T. [1828-29]. A descriptive catalogue of the lepidopterous insects contained in the Museum of the Honourable East India Company, illustrated by coloured figures of new Species and of the metamorphosis of the Indian Lepidoptera, with Introductory Observations on general arrangement of this Order of Insects. London. (24 March 1828: Part 1:ii+80+2 pp. pls. 1,2,3,4; 24 June 1829: Part II:81-144, pls.5-8. (Contains descriptions of many Western Ghats species, including the biology of many species then known).

[1858-1859]. Horsfield, T. & Moore, F. 1858. A Catalogue of the Lepidopterous insects contained in the Museum of the Honourable East-India Company. Vol. 1:i-vi,1-14[1-12],17-278 pp., pls. I-IV,1-11,[1-8] altogether 18 pls; pp.256-278 were on Moths). London. (Contains further additions of species from the Western Ghats).

1881. Moore, F. 1881. Lepidoptera of Ceylon. 1. (Parts ii-iv):41-190, pls. 19-71. London. (Contains butterflies of Sri Lanka, including species found in the Western Ghats. Volumes 2 and 3 were on Moths).

1883. Marshall, G. F. L. & de Nicéville, L. 1883. Butterflies of India, Burmah and

Ceylon. Vol. 1. (Contains families Nymphalidae: Danainae, Satyrinae, Morphinae and Heliconiinae (=Acraeinae). i-vii+1-327 pp. with one coloured frontispiece and 17 plates with numerous text illustrations). Calcutta. (This is the very first systematic work to deal with the butterflies of the Indian region. Reprinted in Delhi in 1979. See under de Nicéville for Volumes 2 and 3).

1886. Nicéville, L. de. 1886c. Butterflies of India, Burmah and Ceylon. Vol. 2. (Nymphalidae: Nymphalinae; Libytheinae, Riodininae. i-iv+1-332 pp. Frontispiece and Pls. 18-24. Calcutta. (Reprinted in Delhi in 1979).

1890. Nicéville, L. de. 1890a. The butterflies of India, Burmah and Ceylon. Vol. 3. (Lycaenidae)i-viii+1-503 pp. Frontispiece and Pls. 25-29. (Feb.1890. Reprinted in Delhi in 1979. Families Papilionidae, Pieridae and Hesperiidae were never published in this work).

1890-1913. Moore, F. & Swinhoe, C. 1890-1913. *Lepidoptera Indica*. Vol. 1-10. (These ten volumes contained the description and biology of all the species then known, including those of the Western Ghats. The only work so far to contain illustrations of all the species. Only 250 sets were known to have been printed and published. Most sets in Indian Libraries are in very bad condition. Details of publication dates of fascicles are given in my Annotated Bibliography).

1905-1907. Bingham, C. T. 1905. Butterflies. Vol. I. *Fauna of British India*. i-xxii+1-511, text illustrations and 10 colour plates. London. [Contains family Nymphalidae].

Butterflies. Vol. II. *Fauna of British India*. i-viii+1-480, text illustrations and 10 colour plates. London. (Contains the families Papilionidae, Pieridae and Lycaenidae in part. This series was also never finished).

1908-1928. Seitz, A. (Ed.). *Macrolepidoptera of the World. Volume 9. Butterflies. The Indoaustralian Region.* Part I. 1197 text pages. Part II. 175 coloured plates. Stuttgart. (Part of the famous series, these were published in German, French and English. Papilionidae by K. Jordan; Pieridae, Nymphalidae and part of Lycaendae by H. Fruhstorfer; Theclinae, Poriitinae and Hesperiidae by A. Seitz. Other volumes dealing with moths were also published. Not every species from the Western Ghats was included. Systematics and nomenclature is outdated, but when critically used coloured illustrations are still very useful).

1909-1927. Bell, T. R. The common butterflies of the plains of India (including those met with in hill stations of the Bombay Presidency). Published in 36 Parts, with 19 colour plates and 2 black and white plates of larvae and pupae. *Journal of the Bombay Natural History Society,* Volume 19 to Volume 31. (This series of papers, which contained the most detailed life-history descriptions of the butterflies of the Western Ghats, when bound together, form a book of more than 1000 pages. For detailed entries, see below under Local Check-Lists).

1924. Antram, C. B. 1924. Butterflies of India. xvi+226, 412 figs. Calcutta and Simla. (Contains only Papilionidae, Pieridae, Nymphalidae. Many species from the Western Ghats were not included).

1924. Ormiston, W. 1924. The Butterflies of Ceylon. Colombo. (Supplements Moore's *Lepidoptera of Ceylon.* Vol. 1. Contains references to the fauna of the Western Ghats).

1927. Evans, W. H. 1927a. The Identification of Indian butterflies (Ed. 1). Madras. Bombay Natural History Society. xii+302 pp., 32 pls., 11 figs. (The first and the only book ever to contain in a single volume all the species of the region including Burma and the

Western Ghats. But only keys).

1932. Evans, W. H. 1932. The Identification of Indian butterflies (Revised 2nd Ed). Madras. Bombay Natural History Society. 10+454 pp, 32 pls, 9 figs. (The only work ever to contain in a single volume the entire fauna of the region (only keys), and still remains the only available work to do so. The Lycaenidae portion was updated by **Cantlie, K. 1963.** The Lycaenidae portion (except the *Arhopala* group) of Brigadier Evans' The Identification of Indian Butterflies. vi+156 pp. 4 pls. Bombay Natural History Society. Bombay).

1937. Peile, H. D. 1937. A Guide to collecting butterflies in India. i-xii, 1-312, pls. i-xxv. London. (Contained about 600 species from the Indian region. Many species from the Western Ghats were not included).

1939-1947. Talbot, G. 1939. Butterflies Vol. 1. (Papilionidae & Pieridae). xxix+600, 1 map, 3 pls. *Fauna of British India*, including Ceylon and Burma. London. Vol. 2. (1947). (Nymphalidae, exclusive of Nymphalinae. Lycaenidae and Hesperiidae were never completed)xv+506,2 pls.

1942. Woodhouse, L. G. O. & Henry, G. M. R. The butterfly fauna of Ceylon. (1st limited edition of 200 copies. See below).

[ca. 1952. No date]. Woodhouse, L. G. O. [1952]. The butterfly fauna of Ceylon. (2nd Revised and expanded edition). xxxii+231, 55 colour pls., 1 map. Colombo. (There was also an abridged edition in 1950. Contains references to the fauna of the Western Ghats. A near complete collection of the butterflies of Sri Lanka is in the Woodhouse Collection in London. It is kept separately).

1957. Wynter-Blyth, M. A. 1957. Butterflies of the Indian Region. xx+523, pls. 72. Bombay Natural History Society. Bombay. (Actually written during the late 1940s and

early 1950s. Many species from the Western Ghats were not included. This is the last work in a book form to deal with the majority of species from the Western Ghats. When used with Larsen's work cited below, this is the only work which should help in the identification of most species. The Wynter-Blyth collection is in London).

1985. Banks, J. & Banks, J. 1985. A Selection of the Butterflies of Sri Lanka. With 16 colour plates of 100 species and a map. Colombo. (Contains only about 100 species from Sri Lanka. No references to the fauna of the Western Ghats).

1992. Gay, T., Kehimkar, I. & Punetha, J. C. 1992. Common Butterflies of India. 1-67 pp., with black and white and coloured illustrations. WWF- India and OUP, Bombay.

(In prep). Gaonkar, H. Natural History of the Butterflies of the Indian Region (including Pakistan, India, Nepal, Bhutan, Bangladesh, Sri Lanka and northern Burma). Vol. 1. Papilionidae. Vol. 2. Pieridae (nearly complete, expected in 1997). Vol. 3. Nymphalidae (in part). Vol. 4. Nymphalidae (concluding). Vol. 5. Lycaenidae and Vol. 6. Hesperiidae (the latter four volumes are under preparation. See below under Local Lists).

Faunistic works on neighbouring areas and countries

Himalaya

Mani, M. S. 1986. Butterflies of Himalaya. Pp. 1-181. Oxford & IBH. Publishing Co. New Delhi. (Despite the title, contains only a fraction of the total Himalayan fauna, which is over 1400 species. Contains innumerable mistakes and biogeographical mis-interpretations. Systematics and nomenclature used were outdated when the book came out).

Nepal

Fujioka, T. 1970. Butterflies collected by the Lepidopterological Research Expedition to Nepal Himalaya. Part I. Papilionoidea. Contributions to the insect fauna of Nepal. Part II. *Special Bulletin of the Lepidopterological Society of Japan,* No. 4:1-125. 31 plates. (First comprehensive treatment of the butterflies of the central Himalaya. Excluding Hesperiidae).

Smith, C. 1981. Field guide to Nepal's butterflies. Pp. 1-94. Illustrated in black and white. (Key to 480 species, with distributional records).

Smith, C. 1989. Butterflies of Nepal (Central Himalaya). Pp. 1-352. Colour figs. 1- 356. Tecpress Service L. P. Bangkok, Thailand. (Brief descriptions of 614 species with uneven quality colour illustrations. New Edition 1993 with additional species amounting to a total of 643 species).

Smith, C. 1993. Illustrated Checklist of Nepal's Butterflies. Pp. 1-126. 46 colour plates of 1360 specimens. Craftman Press, Bangkok, Thailand. (No keys or descriptions. Contains distribution data. History, systematics and taxonomy are outdated).

Sikkim

Haribal, M. 1992. The butterflies of Sikkim and their natural history. Pp. 1-217. With 60 colour plates. Sikkim Nature Conservation Foundation (SNCF), Gangtok, Sikkim. (Out of an estimated 750-800 species, 689 are treated. The Hesperiidae and Lycaenidae are incomplete).

Afghanistan

Sakai, S. 1981. Butterflies of Afghanistan. Pp. 1-272. With 48 colour plates and numerous black and white illustrations. Kodansha, Tokyo. (The text is in Japanese. The first and the only book on the butterfly fauna of this area, also includes a great deal of information on the Indian region).

China

Leech, J. H. 1892-94. Butterflies from China, Japan and Corea. London. Reprinted in Tokyo, 1988 with 4 plates of views, distribution tables and 43 colour plates in 3 vol. (There are no modern and up-to-date monographs on this vast and varied region. However, many Chinese and Japanese scientists are revising various groups. They are all listed in my Annotated Bibliography).

Lee, C.-L. 1958. Butterflies. Academia Sinnica, Peking. Pp.1-198. (In Chinese. Not all species were included).

Nose, Yukinobu. (Editor). 1990. Butterflies and Nature of China. With 130 pages of colour plates of specimens, ecological pictures etc., and maps. Photographs of *Teinopalpus eureus* from Hainan Island. Tokyo. (In Japanese. Deals mostly with southwestern China).

Taiwan

Shirôzu, T. 1960. (And many subsequent reprints). Butterflies of Formosa in colour. Pp.

1-481, with 74 colour plates. (One of the best regional faunistic works ever, contains a great deal of information on shared species between the Indian region and Taiwan. Text in Japanese).

Japan

Fujioka, T. 1975. The butterflies of Japan. Vol. 1-2. Tokyo. (Two large volumes with fine colour plates. One of the best on butterflies of any region).

Thailand

Pinratana, A. B. 1977-1988. Butterflies in Thailand. Vol. 1-6. Brothers of St. Gabriel in Thailand and The Viratham Press, Bangkok, Thailand. (Contains colour illustration and brief description of all the species recorded in Thailand. Quite useful for Indian students).

Malay Peninsula

Corbet, A. S. & Pendlebury, H. M. 1992. The Butterflies of the Malay Peninsula. Malayan Nature Society, Kuala Lumpur. (4th revised edition by **J. N. Eliot**, with colour plates by B. D'Abrera. One of the best books on the regional fauna of the Oriental Region. Quite indispensable to Indian students).

Indonesia and the southeast Asian Islands (including Andaman and Nicobar Islands)

Tsukada, E. (Editor). 1980-. Butterflies of the South East Asian Islands. Plapac, Tokyo. (This multi volume work on one of the most important biodiversity regions of the world is being published in Japanese. Only Volume 1. Papilionidae and Vol. 2. Pieridae are available in English. The rest of the Volumes are in Japanese. This profusely illustrated work includes the Andaman and Nicobar Islands. Six volumes have been published so far. Quite indispensable for Indian students).

Oriental and Australian Regions

D'Abrera, B. L. 1990. Butterflies of the Australian Region. (3rd Edition). xx+416, ills. Melbourne.

D'Abrera, B. L. 1982. Butterflies of the Oriental Region. Part 1. Papilionidae, Pieridae and Danaidae. xxi+244 pp. ills. Ferny Creek, Victoria.

D'Abrera, B. L. 1984. Butterflies of the Oriental Region. Part 2. Nymphalidae, Satyridae and Amathusiidae. +245-534 pp. ills. Ferny Creek, Victoria.

D'Abrera, B. L. 1986. Butterflies of the Oriental Region. Part 3. Lycaenidae and Riodinidae. xv+535-672 pp. ills. Ferny Creek, Victoria. (These well illustrated catalogues of specimens from The Natural

History Museum, London are useful for identification. The series exclude the Hesperiidae. Should be used critically).

Afrotropical Region (including the Arabian Peninsula)

Ackery, P. R., Smith, C. R. & Vane-Wright, R. I. (Editors). 1995. Carcasson's African Butterflies. Pp. 1-803. With 300 colour illustrations. The Natural History Museum, London and CSIRO, Australia. (This monumental work includes all the 3600 species in 300 genera and about 14000 names applied to these).

D'Abrera, B. L. 1980. Butterflies of the Afrotropical Region. Melbourne. xx+593 pp. ills. (Useful, when used with the above work).

Larsen, T. B. 1982. The butterflies of the Yemen Arab Republic. *Biologiske Skrifter, Danske Videnskabernes Selskab,Copenhagen,* 23:1-85. (Illustrated, includes references to Indian region).

Larsen, T. B. 1983. Insects of Saudi Arabia; Lepidoptera, Rhopalocera (a monograph of the butterflies of Arabia). *Fauna of Saudi Arabia,* 5:333-478. (Includes references to Indian region).

Larsen, T. B. 1991. The Butterflies of Kenya, and their natural history. Pp.490, with 64 colour plates. Oxford University Press, Oxford. (These three systematically up-to-date works cover practically all the Afrotropical elements in our region. These also have extensive references, bionomic and biological notes).

Palaearctic Region

(See also under China, Japan and Taiwan).

D'Abrera, B. L. 1990. Butterflies of the Holarctic Region. Part I. Papilionidae, Pieridae, Danaidae & Satyridae (Partim). 1-185. ill. Ferny Creek, Victoria.

D'Abrera, B. L. 1992. Butterflies of the Holarctic Region. Part II. Nymphalidae (in part). 1- 147, ills. Ferny Creek, Victoria.

D'Abrera, B. L. 1993. Butterflies of the Holarctic Region. Part III. Nymphalidae (concludes) and Lycaenidae. 1- 1-190, ills. Ferny Creek, Australia. (Like the above series these are illustrated catalogues of specimens from The Natural History Museum, London. Useful for identifications, but should be critically used. The series excludes the Hesperiidae).

3. Published Local Check-Lists

In this category, I include only the local check-lists and smaller notes that were published, during the past hundred years, mainly in the *Journal of the Bombay Natural History Society*. The quality of information in these check-lists varies. Many of them have the barest minimum of information, like the scientific name of the species, with information on the rarity or the commonness of the species. However, specimens on which many of these check-lists were prepared, carry locality information. Majority of the specimens cited are now housed in The Natural History Museum in London. These materials were very important for the above mentioned works of systematic faunistics of the Indian region.

However, these faunistic works were rather generalised and ambiguous in mentioning precise localities. For example, most works do not even mention the Western Ghats, but often, and as a rule, only use the vague geographical term "South India." They are however mentioned under systematic works above. As mentioned above in the Introduction, only two studies are really comprehensive for the Western Ghats. The first, of course is the outstanding work of T. R. Bell. Bell studied the butterflies and moths of the Western Ghats during his stay of over fifty years, mostly in the North Kanara (Uttara Kannada) District of Karnataka, also in Maharashtra and Sind (now in Pakistan). Bell died in Karwar in 1948. In the post war period, only Torben Larsen's faunistic work on the Nilgiris and adjacent areas of the Western Ghats, is comprehensive. Other studies on local faunistics are mere check-lists, with a great deal of misidentifications and little data

Abdulali, S. 1973. The occurrence of the common Palmfly (*Elymnias hypermnestra caudata*) near Bombay. *Journal of the Bombay Natural History Society*, 70:228.

Abdulali, S. 1981. More butterflies from Bombay. *Journal of the Bombay Natural History Society*, 77:531-532.

Abdulali, S. 1983. More butterflies from Bombay - 2. *Journal of the Bombay Natural History Society*, 79:216.

Aitken, E. H. 1886a. A list of Bombay butterflies in the Society's Collection. *Journal of the Bombay Natural History Society*, 1:126-135.(General data)

Aitken, E. H. 1886b. A list of butterflies of the Bombay Presidency in the Society's Collection. *Journal of the Bombay Natural History Society*, 1:215-218. (General data)

Aitken, E. H. 1887. A list of the butterflies of Bombay Presidency in the Society's

Collection. *Journal of the Bombay Natural History Society,* 2:35-44.(WG: KA: MH: GU. Data out of date)

Aitken, E. H. 1894. The Larva and Pupa of *Spalgis epeus* Westwood. *Journal of the Bombay Natural History Society,* 8:485, Pl. A.

Aitken, E. H. & Comber, E. 1903. A list of the butterflies of Konkan. *Journal of the Bombay Natural History Society,* 15:42-55. (WG: KA: MH: GU. Data partially valid. Collections in Bombay and London)

Aldrich, H. 1946. Butterflies of the Kaira District - a list. *Journal of the Bombay Natural History Society,* 46:374-377. (GU. Data valid. Collection in London)

Bean, A. E. 1960. Appearance of *Nacaduba pactolus continentalis* Fruh. (Lepidoptera: Lycaenidae) in Lonavla, Western Ghats. *Journal of the Bombay Natural History Society,* 56:467-452. (WG:MH: Poona)

Bean, A. E. 1965. Notes on the life history of *Nacaduba pactolus continentalis* Fruh., (Lepidoptera: Lycaenidae) from Poona District, Western Ghats. *Journal of the Bombay Natural History Society,* 61:614-626. (WG:MH:Poona).

Bean, A. E. 1968. Occurrence of *Spindasis abnormis* (Moore), (Lepidoptera: Lycaenidae) on the Western Ghats. *Journal of the Bombay Natural History Society,*65:618-632. (WG:MH: Pune: Matheran. Data accurate)

Bean, A. E. 1988. Observations on the occurrence and habits of the *Nacaduba* complex of Lycaenidae (lepidoptera), mainly from Poona District, Western Ghats. *Journal of the Bombay Natural History Society,* 82:332-363. (MH. Data valid. Collection in Oxford)

Bean, A. E. 1985. Some curious Lycaenid butterflies of the Bombay and Pune area. *Hornbill,* 1985(1):19-20; 1985(2):22-24. (WG:MH).

Bean, A. E. 1986. Some curious Lycaenid butterflies of the Bombay and Pune area. *Hornbill*, 1986(1):32-33, 40. (WG:MH).

Bell, T. R. 1909. Common butterflies of the plains of India. *Journal of the Bombay Natural History Society*, (Introduction and Nymphalidae). 19:16-58, 438-74, 635-682. (WG: KA: North Kanara: GO: MH: Mahabaleswar etc. All the following entries are from these geographical areas. Part I and II of this series was by Young, see below).

Bell, T. R. 1910. Common butterflies of the plains of India. Parts VII, VIII. *Journal of the Bombay Natural History Society*, (Nymphalidae, continued), 19:846-879, 20:279-330.

Bell, T. R. 1911. Common butterflies of the plains of India. Part IX (Papilionidae). *Journal of the Bombay Natural History Society*, 20:1115-1136.

Bell, T. R. 1912. Common butterflies of the plains of India. Parts X, XI (Papilionidae, continued). *Journal of the Bombay Natural History Society*, 21:517-544, 740-766. Part XII (Pieridae), 21:1131-1157.

Bell, T. R. 1913. Common butterflies of the plains of India. Parts XIII, XIV, XV (Pieridae, continued). *Journal of the Bombay Natural History Society*, 22:92-100, 320-44, 517-531.

Bell, T. R. 1914. Common butterflies of the plains of India. Part XVI (Pieridae, continued) . *Journal of the Bombay Natural History Society*, 23:73-103.

Bell, T. R. 1915. Common butterflies of the plains of India. Part XVII (Notes on Pieridae, Lycaenidae). *Journal of the Bombay Natural History Society*, 24:481-498.

Bell, T. R. 1916. Common butterflies of the plains of India. Part XVIII (Lycaenidae, continued). *Journal of the Bombay Natural History Society*, 24:656-672.

Bell, T. R. 1918. Common butterflies of the plains of India. Parts XIX, XX (Lycaenidae, continued). *Journal of the Bombay Natural History Society*, 25:430-453, 636-644; Part XXI

26:98-140.

Bell, T. R. 1919. Common butterflies of the plains of India. Parts XXII, XXIII (Lycaenidae, continued) *Journal of the Bombay Natural History Society*, 26:438-487, 750-769.

Bell, T. R. 1920. Common butterflies of the plains of India. Parts XXIV, XXV (Lycaenidae, continued). *Journal of the Bombay Natural History Society*, 26:941-954, 27:26-32; Part XXVI (Hesperiidae) 27:211-227.

Bell, T. R. 1921. Common butterflies of the plains of India. Parts XXVII, XXVIII (Hesperiidae, continued). *Journal of the Bombay Natural History Society*, 27:431-447, 778-793.

Bell, T. R. 1923. Common butterflies of the plains of India. Parts XXIX, XXX (Hesperiidae, continued). *Journal of the Bombay Natural History Society*, 28:429-455, 703-717.

Bell, T. R. 1924. Common butterflies of the plains of India. Part XXXI (Hesperiidae, continued). *Journal of the Bombay Natural History Society*, 29:921-946, Part XXXII, 30:132-150.

Bell, T. R. 1925. Common butterflies of the plains of India. Parts XXXIII, XXXIV, XXXV (Hesperiidae, continued). *Journal of the Bombay Natural History Society*, 30:285-305, 561-585, 820-837.

Bell, T. R. 1926. Common butterflies of the plains of India. Parts XXXVI, XXXVII (Hesperiidae, continued). *Journal of the Bombay Natural History Society*, 31:323-351, 655-686.

Bell, T. R. 1927. Common butterflies of the plains of India. Part XXXVIII (Hesperiidae, continued) *Journal of the Bombay Natural History Society*, 31:951-974. (WG: KA: MH:

GU. Bell's detailed data for about 250 species of the Western Ghats on the distribution, biology, and bionomics are the most complete and still valid, but nomenclature is somewhat out of date. These papers bound together run to more than 1000 closely printed pages. Most of Bell's data are reconfirmed by this present writer over a period of more than thirty years. Apart from these published studies, Bell's **Notebooks** in The Natural History Museum, London, also give comprehensive data. A complete collection of butterflies by Bell is in London, incorporated in the general collection. Some are also present in Bombay and Dharwar).

Bell, T. R. & Fletcher, T. B. 1921. Some south Indian Insects. *Journal of the Bombay Natural History Society,* 27:787-788.

Best, A. E. G. 1951. The butterflies of Bombay and Salsette. *Journal of the Bombay Natural History Society*, 50:331-339.(WG: MH. Data slightly outdated).

Best, A. E. G. 1954. Notes on the butterflies from Nagalapuram Hills, eastern Ghats. *Journal of the Bombay Natural History Society,* 52:365-373. (Eastern Ghats (EG): Andhra Pradesh (AP): TN. Data still valid).

Best, A. E. G. 1955. Further notes and additions to the list of butterflies from Bombay and Salsette. *Journal of the Bombay Natural History Society*, 54:215. (WG:MH.)

Best, A. E. G. 1977. Additions and alterations to the list of butterflies of Nagalapuram Hills published in Vol. 52 no. 2 & 3 August-Dec. 1954. *Journal of the Bombay Natural History Society*, 74:189-190.(IND: EG: AP: TN).

Best. A. E. G. 1977. Additions and alterations to the list of butterflies of Bombay and Salsette Vol. 50(2) Dec. 1951. *Journal of the Bombay Natural History Society*, 74:190-191. (WG:MH. Many specimens in London).

Betham, J. A. 1890. The butterflies of the Central Provinces. *Journal of the Bombay Natural History Society,* 5:(Part I) 19-28; (Part II) 151-161; (Part III) 279-286. (Madhya Pradesh (MP): AP:MH.).

Betham, J. A. 1891. The butterflies of the Central Provinces. *Journal of the Bombay Natural History Society,* 6:(Part IV) 175-183; (Part V) 318-331. (MH: MP: AP).

Betham, J. A. 1892. The butterflies of the Central Provinces. *Journal of the Bombay Natural History Society,*6:423-429. (MH: MP: AP. Specimens in London).

Blatter, E. 1908. Caterpillars as Ant's Pets. *Journal of the Bombay Natural History Society,* 18:591-595.

Briscoe, M. V. 1952. Butterfly migration in the Nilgiris. *Journal of the Bombay Natural History Society,* 50:417-418. (WG:TN: Nilgiris)

Broughton, T. D. 1936. Occurrence of the butterfly (*P. antiphates naira*) in the Nilgiris. *Journal of the Bombay Natural History Society*, 38:834. (WG:TN).

Butler, A. G. 1880. On a small collection of Lepidoptera from Western India and Beluchistan. *Annals and Magazine of Natural History*, (5)5:221-226. (MH:GU)

Butler, A. G. 1881. On a collection of Lepidoptera from Western India, Beluchistan and Afghanistan. *Proceedings of the Zoological Society of London*, 1881:601-624. (MH:GU)

Butler, A. G. 1886. On Lepidoptera collected by Major Yerbury in Western India. *Proceedings of the Zoological Society of London,* 1886:355-395. (MH: GU)

Chaturvedi, N. 1980. The Red Pierrot *Talicada nyseus* Guerin (Lepidoptera: Lycaenidae) in Bombay and the Salsette island. *Journal of the Bombay Natural History Society*, 76:369.

Chaturvedi, N. & Satheesan, S. M. 1980-1984. Butterflies of Bombay. Part I - Part 14. *Hornbill,* Part. I. 1980(1):6-8, 32 (Danainae, Papilionidae); Part 2. 1980(2):8-9, 16

(Papilionidae); Part 3. 1980(3):26-28 (Pieridae); Part 4. 1980(4):30-31; Part 5. 1981(1):27-28, Part 6. 1981(2):28-29 (Nymphalidae); Part 7. 1981(3):34-35 (Nymphalidae); Part 8. 1981(4):34-35 (Lycaenidae); Part 9. 1982(1):28-29 (Lycaenidae); Part 10. 1982(2):38-39 (Lycaenidae); Part 11. 1982(4):32-33 (Lycaenidae); Part 12. 1983(1):30-31 (Hesperiidae); Part 13. 1984(1):38-39 (Hesperiidae); Part 14. 1984(3):38-39 (Satyrinae, concluded). (WG:MH. Contains 119 coloured figs. Some host-plant data are misidentifications. The series is useful for the identification of butterflies of the northern Western Ghats).

Comber, E. 1903. Further notes on Konkan butterflies. *Journal of the Bombay Natural History Society,* 15:356-357. (WG:MH).

Davidson, J. 1893. Butterflies of Matheran. *Journal of the Bombay Natural History Society*, 8:556. (WG:MH. Data still valid. Specimens in London)

Davidson, J. & Aitken, E. H. 1890. Notes on larvae and pupae of some butterflies of Bombay Presidency. *Journal of the Bombay Natural History Society*, 5:260-278, 349-375, 369-374, 381, with Plates, A, B, E, F and figs.1-4a. (WG:KA. Data still valid)

Davidson, J., Bell, T. R. & Aitken, E. H. 1896. The butterflies of north Canara district of the Bombay Presidency. Part. I-II. *Journal of the Bombay Natural History Society*, 10:237-259, 269, 277,349, 372-93; with plates I-V. figs. a. (WG:KA. Data still valid)

Davidson, J., Bell, T. R. & Aitken, E. H. 1897. The butterflies of north Canara District of the Bombay Presidency. Part III-IV: *Journal of the Bombay Natural History Society*, 10:568-584; 11:22-63; with plate VI, figs. 1,1a,4-6a. (MH: KA. Collection in Bombay and London).

Devarshi, D. & Trigunayat, M. M. 1993. On distribution of Spot Swordtail Butterfly *Pathysa nomius nomius* Esper. *Journal of the Bombay Natural History Society*, 89:385.

Donahue, J. P. 1967. An annotated list of the butterflies of Delhi, India. *Journal of the Bombay Natural History Society,* 63:235-269, 64:22-48.

(Delhi:Uttar Pradesh: Hariyana). (Collection in Dept. Entomology, Michigan State University, East Lansing, Michigan, USA; and in the Natural History Museum, Los Angeles, USA. Contains distribution data for about 80 species from adjacent areas of the Western Ghats).

Editors (JBNHS). 1959. Butterflies of Bombay and Salsette - further additions. *Journal of the Bombay Natural History Society,* 56:358-359.

Editors (JBNHS), 1960. Additions to the butterflies of Bombay and Salsette. *Journal of the Bombay Natural History Society,*57:233-234.

Elamon, S. (1993). Butterflies of Periyar Tiger Reserve. Project Report submitted to the Kerala Forest Department. (Contains data on only 160 species out of an estimated number of about 300 species. Lycaenidae, Hesperiidae and Satyrinae are incomplete. Project Report given by the author).

Evans, W. H. 1910. The butterflies of the Palni Hills. *Journal of the Bombay Natural History Society,* 20:380-391. (WG:TN:KE. Data slightly outdated. Evans collection is in London).

Evans, W. H. 1929. On a new form of Hesperid butterfly (*Baoris canaraica yatesi*) from Coorg. *Journal of the Bombay Natural History Society,* 33:1000-1001. (WG:KA).

Fergusson, H. S. 1891. A list of the butterflies of Travencore. *Journal of the Bombay Natural History Society,* 6:438-448. (WG: KE. Most of the data still valid. Specimens in Calcutta, Bombay and London).

Florence, J. 1926. The occurrence of the butterfly *Appias indra* var. *aristoxenus* in the

Nilgiris. *Journal of the Bombay Natural History Society*, 31:529. (TN: KE).

Fraser, F. C. 1911. *Colotis* in Sindh. *Journal of the Bombay Natural History Society,* 20:867-869. (PAK: Sindh: Karachi)

Fraser, F. C. 1930. A Note on some Malabar Lepidoptera. *Journal of the Bombay Natural History Society*, 34:260-261.(WG: KE. Data still valid. Collection in London).

Gaonkar, H. 1988. Where have all the butterflies gone? *Poona Digest* 4(5):42-45. (WG:MH:Poona, explains the decline of butterflies in the northern Western Ghats).

Gaonkar, H. 1990. *Graphium antiphates* Cramer in India - A note on taxonomic and nomenclatural History. *Papilio International*, 6(3):479-484.

Gaonkar, H. 1994. A systematic catalogue of the butterflies and host-plants of the Western Ghats, India. In Gadgil. M. *et al. Western Ghats Biodiversity Inventory Programme, field methodology.* Centre for Ecological Sciences, Indian Institute of Science, Bangalore. (Contains families Papilionidae and Pieridae).

Gaonkar, H. (in prep.). An Annotated Bibliography of the Butterflies of the Indian Region. (Contains an annotated, historical bibliography of more than 5000 entries. Contains in a Database. However, WordPerfect 6.0 (6.1), Microsoft Word 6.0 users may request a copy from me. Also deposited in Zoological Museum, Copenhagen; The Natural History Museum, London; Centre for Ecological Sciences, Indian Institute of Science, Bangalore; Bombay Natural History Society).

Gaonkar, H. (In prep.). Butterflies of the Western Ghats, India. Part II. Their Biology and Conservation in Critical Areas. (Documents the biology and life-history with descriptions of their host-plants. Supplement to this study).

Gaonkar, H. (in prep). The Natural History of the Butterflies of the Western Ghats, India.

(A completely illustrated field guide to the biology of butterflies including their host-plants' description).

Gaonkar, H. & Vane-Wright, R. I. (in prep). *A Biodiversity Atlas of the Butterflies of the Western Ghats, India and Sri Lanka.* (A biodiversity assessment Atlas based on the WORLDMAP, Quarter Degree Grid, at The Natural History Museum London. Will contain data presented in this study and identification of various micro faunal centres, patterns of distribution, taxically rich areas, centres of endemism, critical areas, and recommendations for conservation. The first work of its kind for the Oriental Region).

Ghorpadé, K. 1986. Butterflies. In Hawkins, R. E. (Ed.) *Encyclopedia of Indian Natural History*:85-89, ills. Bombay Natural History Society.

Ghosh, S. K. & Chaudhury, M. 1986. On the collection of Lepidoptera from the Silent Valley. *Records of the Zoological Survey of India*, 84:107-109. (IND: WG: KE. Data incomplete).

Ghosh, S. K., Mandal, D. K. & Chaudhury, M. 1990. Butterflies of Maharashtra and Gujarat, India. *Record of the Zoological Survey of India,* 86:15-38. (MH, GU. Specimens in Calcutta. Data incomplete).

Hampson, G. F. 1888. The butterflies of the Nilgiri District, South India. *Journal of the Asiatic Society of Bengal*, 47:346-368.(WG:TN. Data outdated. Collection in London).

Hannyngton, F. 1916. Notes on Coorg butterflies. *Journal of the Bombay Natural History Society*, 24:578-581. (WG:KA. Data outdated)

Hannyngton, F. 1918. Life history of Coorg butterflies. *Journal of the Bombay Natural History society,* 26:871-872.(WG:KA. Data still valid. Collection in London).

Home, W. M. L. 1934. Notes on Coorg butterflies. *Journal of the Bombay Natural History*

Society, 37:669-674. (WG:KA. Data still valid)

Home, W. M. L. 1935. The butterflies of Secunderabad. *Journal of the Bombay Natural History Society,* 37:892-894. (IND: AP. Collection in London.).

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Karthikeyan, S. 1993. Butterflies of Shevaroys. *Blackbuck,* Madras, 8(3):89-93. (IND: Eastern Ghats: Tamil Nadu. Not complete).

Karthikeyan, S. (1995) 1995. Butterflies of the Kolli Hills. *Blackbuck*, Madras, 10(1):21-24. (IND: EG: TN).

Khatri, T. C. 1986a. On some phenological and geographical variations in the butterflies from Eastern Ghats. In *Eastern Ghats Insect Survey Project. Eastern Ghats Insects*, Part 2:1-17. Zoological Survey of India, Madras.(IND: EG: TN: AP. Not complete, contains inaccuracies).

Khatri, T. C. 1986b. Some additional notes on butterflies of Javadi Hills, Eastern Ghats. *Eastern Ghats Insects*, Part I:39-43. Zoological Survey of India, Madras. (IND: EG: TN: AP).

Khatri, T. C. 1986c. On a collection of butterflies from the Kolli Hills, Eastern Ghats. *Eastern Ghats Insects*, Part I:44-60. Zoological Survey of India, Madras. (IND:EG: TN:AP).

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Larsen, T. B. 1987-88. The butterflies of the Nilgiri mountains of southern India. *Journal of the Bombay Natural History Society,* 1987, 84:26-54; 219-316; 560-584; 1988, 85:26-43. (WG: TN: KE: KA. By far the most comprehensive study of 299 species found on the Nilgiri Hills, updating data from Hampson to Wynter-Blyth. Data up to date. Contains extensive bibliography. Collection in London).

Larsen, T. B. 1986. *Ageratum conyzoides* (Compositae) indirectly confirmed as a source for pyrrolizidine alkaloids. *Journal of the Bombay Natural History Society*, 83:458-459.

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Larsen, T. B. 1987. Butterfly migrations in South India. *Blackbuck,* Madras. 3:12-13.

Larsen, T. B. 1987c. Swallowtail communities in southern India. *Papilio International*, 4:275-280. (The first ecological analysis of all the 19 Papilionidae of the Western Ghats).

Longstaff, G. B. 1912. Butterfly Hunting in Many Lands. With 17 plates. London. (WG:TN:Nilgiris; Sri Lanka. Contains an account of this writer's butterfly hunting in India and Sri Lanka).

Mandal, D. K. 1991. Insecta: Lepidoptera. In *Fauna of Lakshadweep Islands*:215-255. Zoological Survey of India, New Delhi. (Lakshadweep Islands)

Mathew, G. 1991. Butterflies of Silent Valley. *Evergreen, Newsletter of Kerala Forest Research Institute*, 26:1-3. (WG:KE. Contains an estimation of 100 species out of Silent Valley's 300 plus butterflies. Data incomplete).

Matthew, K. M. 1994. Classified Checklist of Butterflies (Lepidoptera: Rhopalocera).Appendix I. In Matthew, K. M. (Ed).. *Handbook of the Anglade Institute of Natural History, Shembaganur*, The Rapinat Herbarium, Tiruchirapalli.(WG: TN: KE.

Collection in Shembaganur)

MacPherson, A. D. 1927. Notes on a collection of butterflies made in Jodhpur and Mount Abu during the years 1924, 1925 and 1926. *Journal of the Bombay Natural History Society*, 32:228-230. (IND: Aravalli Mountains: GU: Rajasthan. Data still valid)

Macpherson, T. 1887. Note on *Hestia malabarica*. *Journal of the Bombay Natural History Society*, 2:164-165. plate. (KA: North Kanara)

Menesse, N. H. 1950. Butterflies of Sindh. *Journal of the Bombay Natural History Society* 49:20-24. (PAK:Sind).

Morgan, R. 1887. List of some butterflies of Malabar and the Western Ghats. In, Logan, W. *The Malabar Manual*, 2 (Appendix):lxiii-lxv. (WG: KE. Data out of date. Collection in London.)

Mosse, A. H. R. 1929b. A note on the butterflies and hawk-moths of Kathiawar. *Journal of the Bombay Natural History Society*, 33:888-892. (GU. Data still valid)

Nicéville, L. de. 1890. The food plants of Kanara District of Bombay Presidency, with a revision of the butterflies occurring. *Journal of the Asiatic Society of Bengal*, 69(3):187-278. (WG:KA:MH. Host-plant data still valid. Systematics is out of date. Collection in Calcutta).

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Phillips, W. W. A. 1964. Some observation on the fauna of the Maldive Islands. Part VII. Butterflies. *Journal of the Bombay Natural History Society*, 61:396-401. (Maldive Islands)

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Rae, C. J. 1937. Some Karachi butterflies. *Journal of Sind Natural History Society*, Karachi. 3(2):37-39. (PAK: Sind: Karachi)

Rae, C. J. 1938. On the Occurrence of some butterflies in Nasik. *Journal of the Bombay Natural History Society,* 40:775. (IND: MH)

Ramu, G. 1989. Checklist of butterflies of lower Droog-Nellithurai forest, Western Ghats. *Indian Journal of Forestry,* 12(3):238-240. (WG:TN. Contains some mis-identifications, this is not a complete check-list).

Rhé Philipe, G. W. V. de. 1908. Butterflies of the Konkan. *Journal of the Bombay Natural History Society,* 18:884-886. (WG: MH. Specimens in Booth Museum, Brighton, UK)

Sanders, D. F. 1955. Miscellaneous notes on Indian butterflies. *Journal of the Bombay Natural History Society*, 52:803-830. (Contains notes on various species from the WG).

Sathe, T. V., Inamdar. S. A. & Santhakumar, M. V. (Published in 1991). Fauna of Butterflies from Western Maharashtra and Western Ghat (Part of Maharashtra only) India. *Journal of Shivaji University (Science)*, (1986-87), 23:391-398. (MH: southwestern. Contains misidentifications and host-plant inaccuracies)

Satyamurthi, S. T. 1966. Descriptive Catalogue of the Butterflies in the Collection of the Madras Museum. *Bulletin of the Madras Government Museum, New Series, Natural History,* 8(1):1-255, with 31 plates. (Very much outdated, but still useful).

Shull, E. M. 1963. The butterflies of south Gujarat. *Journal of the Bombay Natural History Society* 60:585-599. (WG: GU. Data still valid)

Shull, E. M. 1964. The butterflies of south Gujarat, a supplementary note. *Journal of the Bombay Natural History Society* 61:464-466. (WG: GU. Data still valid. Collection in London).

Swinhoe, C. 1884. On Lepidoptera collected in Kurrachee. *Proceedings of the Zoological Society of London,* 1884:503-528, pls 47-48. (PAK:Sind)

Swinhoe, C. 1885. On the Lepidoptera of Bombay and the Deccan. *Proceedings of the Zoological Society of London,* 1885:124-148. pl. 9.(WG: MH: GU. Data out of date)

Swinhoe, C. 1886. On the Lepidoptera of Mhow. *Proceedings of the Zoological Society of London, 1886*:421-465, pls. 40-41.(IND:MP).

Swinhoe, C. 1887. The Lepidoptera of Karachi and its neighborhood. (Part 1). *Journal of the Bombay Natural History Society*, 2:269-280.(PAK:Sindh. Swinhoe collection is in London and Oxford).

Ugarte, E. & Rodricks, L. 1960. Butterflies of the Palni Hills: a complementary list. *Journal of the Bombay Natural History Society,* 57:270-277. (WG: TN. Data still valid. Collection in Shembaganur).

Usman, S. & Puttarudraiah, M. 1955. A List of the Insects of Mysore including the Mites. *Bulletin, Departement of Agriculture, Mysore (Entomology Series, No. 16.* vi+1-194. (Lepidoptera: Rhopalocera, pp. 68-78. About 137 species of butterflies recorded from the old Mysore State).

Varshney, R. K. 1977. Index Rhopalocera Indica. An Index of the Local-Lists of butterflies from India and Neighbouring Countries. *Records of the Zoological Survey of India,* 73:159-177. (Incomplete with inaccuracies).

Varshney, R. K. 1993. Index Rhopalocera Indica. Part III. Genera of butterflies from India and neighbouring countries[Lepidoptera: (A)]Papilionidae, Pieridae, Danaidae]. *Oriental Insects,* 27:347-372. (Outdated nomenclature with inaccuracies, should not be used without consulting authorities mentioned above and below).

Varshney, R. K. 1994. Index Rhopalocera Indica. Part III. Genera of butterflies from India and neighbouring countries [Lepidoptera : (B) Satyridae, Nymphalidae, Lybitheidae and Riodinidae]. *Oriental Insects,* 28:151-198. (As above).

Vinetha, R. 1988. List of butterflies collected in certain areas of Kanyakumari District (Tamil Nadu). M.Sc. Dissertation, Department of Zoology, Scott Christian College, Nagarcoil, May 1988. pp. 1-30, with illustrations. (MS made available by Ranjit Daniels of M. S. Swaminathan Foundation, Madras).(WG:TN).

Watson, E. Y. 1890a. A preliminary list of butterflies of Madras. *Journal of the Asiatic Society of Bengal,* 49:265-269. (WG: TN. Data out of date)

Watson, E. Y. 1890b. A preliminary list of butterflies of Mysore. *Journal of the Bombay Natural History Society,* 5:28-37. (WG: KA: TN. Data out of date. Collection in London).

Winchworth, H. C. 1928. The occurrence of the Wood Mason butterfly *(Parantirrhoea marshalli*) in Coorg. *Journal of the Bombay Natural History Society*, 32:230-231. (WG:KA:KE).

Wirth, B. W. (Reported by the Editors). 1959. Butterflies of Bombay and Salsette. Further additions. *Journal of the Bombay Natural History Society,* 56:358-359.(WG: MH. Data still valid)

Witt, D. O. 1909. The Butterflies (Rhopalocera) of Nimar District, Central Provinces. *Journal of the Bombay Natural History Society*, 19:565-571. (IND:MP).

Wynter-Blyth, M. A. 1944. The butterflies of the Nilgiris. *Journal of the Bombay Natural History Society*, 44:536-549. (WG:TN. Data updated by Larsen, 1987-1988).

Wynter-Blyth, M. A. 1944. Some interesting butterflies. *Journal of the Bombay Natural History Society,* 44:601-602.

Wynter-Blyth, M. A. 1945. Addenda and corrigenda to Nilgiri butterflies. *Journal of the Bombay Natural History Society*, 45:613-616. (WG:TN. Data updated by Larsen, 1987-88)

Wynter-Blyth, M. A. 1947. Additions to "The butterflies of Nilgiris" published in Vol 44, no. 4 and Vol. 45, no. 1. *Journal of the Bombay Natural History Society*, 46:736. (WG:TN. Data updated by Larsen, 1987-88. Wynter-Blyth collection, or whatever remained, is in London).

Yates, J. A. 1929. Some notes on the Travancore Evening Brown butterfly (*Parantirrhoea marshalli*) in Coorg. *Journal of the Bombay Natural History Society*, 33:455-457. (WG:KA:KE. Data still valid)

Yates, J. A. 1930. Notes on *Pathysa antiphates naira*. *Journal of the Bombay Natural History Society*, 34:589-590. (WG:KA. Data still valid)

Yates, J. A. 1930. Notes on *Parantirrhoea marshalli* and *Prioneris sita*. *Journal of the Bombay Natural History Society*, 34:832-833.

Yates, J. A. 1930c. Notes on *Appias libythea* female. *Journal of the Bombay Natural History Society*, 34:834.

Yates, J. A. 1931a. The butterflies of Coorg. Part I. *Journal of the Bombay Natural History Society*, 34:1003-1014. (WG:KA. Data still valid).

Yates, J. A. 1931b. The butterflies of Coorg. Part II. *Journal of the Bombay Natural History Society*, 35:104-114. (WG:KA. Data still valid. Yates's MS from Coorg is with me).

Yates, J. A. 1932. Characters of *Appias libythea libythea* and *A. albina darada*, the dry and wet season forms of *Prioneris sita*. *Journal of the Bombay Natural History Society*, 35:698-701. ill.

Yates, J. A. 1933. The Butterflies of Bangalore and Neighbourhood. *Journal of the Bombay Natural History Society,* 36(2):450-459. (KA. Data slightly outdated, but still useful)

Yates, J. A. 1935. Butterflies of the Nilgiri District. *Journal of the Bombay Natural History Society*, 38:330-340. (WG:TN:KA. Data updated by Larsen, 1987-1988)

Yates, J. A. 1946. The butterflies of the Nilgiris - a supplementary note. *Journal of the Bombay Natural History Society*, 46:197-198. (WG:TN:KA. Data updated by Larsen, 1987-1988. Yates collection is in London).

Young, L. C. H. 1903a. The classification of the Lepidoptera Papilionina. *Journal of the Bombay Natural History Society,* 15:294-311. (Classification is outdated).

Young, L. C. H. 1903b. Synonymic Catalogue of the Lepidoptera Papilionina in the Society's Collection. *Journal of the Bombay Natural History Society,* 15:483-497. (Classification is outdated).

Young, L. C. H. 1904. The distribution of butterflies in India. *Journal of the Bombay Natural History Society,* 15:594-601. (Some data still valid).

Young, L. C. H. 1907. Common butterflies of the plains of India. Part I. *Journal of the Bombay Natural History Society*, 16:570-579. (Data outdated).

Young, L. C. H. 1907. Common butterflies of the plains of India. *Journal of the Bombay Natural History Society*, 17:921-927. (This series was continued and completed by T. R. Bell).

4. Works on Butterfly Systematics

The higher classification of Lepidoptera (butterflies and moths) is an exact science with a long history. Since I have annotated practically every relevant work in my Annotated Bibliography, I include here only the modern works. These works are essential for assessing the biodiversity (from families down to species) of butterflies of this region. All works listed below not only contain extensive references, but also discuss previous works. Publications are chronologically arranged.

Lepidoptera

Scoble, M. J. 1992. The Lepidoptera. Form, Function and Diversity. i-xi+1-404, with colour and black and white illustrations. Natural History Museum, London and Oxford University Press. (An up-to-date higher classification down to the subfamily level of moths and butterflies, with biological and bionomic notes. Includes an extensive bibliography. Treats the south American Hedyloidea as butterflies along with Papilionoidea and Hesperioidea to form a monophyletic group. Another work which is highly relevant to us is mentioned below).

Nielsen, E. S., Edwards, E. D. & Rangsi, T. V. 1996. *Checklist of the Lepidoptera of Australia*. CSIRO, Melbourne, Victoria, Australia.

Add Holloway, J.D. et al.

Papilionoidea and Hesperioidea

Ehrlich, P. R. 1958. The comparative morphology, phylogeny and higher classification of the butterflies (Lepidoptera: Papilionoidea). *University of Kansas Science Bulletin*, 24:1-23. (The first modern work to re-organize the higher classification of all the butterfly families and subfamilies on phenetic grounds).

Kristensen, N. P. 1976. Remarks on the family-level phylogeny of butterflies (Insecta, Lepidoptera, Rhopalocera). *Zeitschrift für Zoologische Systematik und Evolutionsforschung*, 14:25-33. (The first work to employ Hennigian methods for butterflies. Although minor modifications have been suggested by subsequent workers, this work still remains as a milestone on higher classification of all the butterfly groups).

Vane-Wright, R. I. & Ackery, P. R. 1984. (Editors). *The Biology of Butterflies*. Pp. I-xxiv + 1-429. Royal Entomological Society, London. (A collection of modern papers on various biological aspects of butterflies, with an extensive bibliography; also contains: **Ackery, P. R.** Systematic and faunistic studies on butterflies. Pp. 9-21. A second paperback edition with further bibliographical material came out in 1989).

Scott, J. A. 1984 (1985). The Phylogeny of Butterflies (Papilionoidea and Hesperioidea). *Journal of Research on the Lepidoptera*, 23:241-281. (Followed the same principles as Kristensen, but failed to document the species examined).

de Jong, R., Vane-Wright, R. I. & Ackery, P. R. 1996. The higher classification of butterflies (Lepidoptera): problems and prospects. *Entomologica Scandinavica*, 27:65-101. (Discusses the higher classification of butterfly families and subfamilies in relation to some

other Lepidopteran families; also reviews previous work. I have followed this work in this study).

Ackery, P. R., de Jong, R. & Vane-Wright, R. I. (in press). The Butterflies. In **Kristensen, N. P.** (Editor). *Handbook der Zoologie (Lepidoptera)*. Berlin. (This work, when published, should give us an up-to-date understanding of the higher classification of butterflies, and their relationship to moths).

Papilionidae

Munroe, E. 1960. The Classification of the Papilionidae (Lepidoptera). *Canadian Entomologist. Suppl.*, 17:1-51. (Higher classification of all the Swallowtail groups).

Igarashi, S. 1979. Papilionidae and their early stages. Vol. 1:1-218 (Text) ;2:i-xvi+ 223 colour plates, 103 black and white plates, Folio. Tokyo. (In Japanese. Classification and biology, includes all Indian groups. One of the best books ever published on butterflies).

Igarashi, S. 1984. Classification of the Papilionidae Mainly Based on the Morphology of Their Immature stages. *Tyô to Ga,* 34:41-96. (Systematics, Papilionidae).

Hancock, D. L. 1983. Classification of Papilionidae: a phylogenetic approach. *Smithersia*, 2. Bulawayo, Zimbabwe. (A phylogenetic treatment of all the groups, including species).

Miller, J. S. 1987. Phylogenetic studies in the Papilioninae (Lep: Pap). *Bulletin of the American Museum of Natural History*, 186(4):365-512. (A cladistic treatment of Papilioninae).

Bridges, C. A. 1986. Catalogue of Papilionidae & Pieridae. (Lepidoptera: Rhopalocera). 461 pp. Urbana, Illinois, USA. (Genus group, species group names with extensive

bibliography).

Pieridae

Klots, A. B. 1933. A generic revision of the Pieridae together with a study of the male genitalia. *Entomologica Americana*, 12:139-242. (The only complete Revision of the entire Pieridae).

Yata, O. 1981. Pieridae. In Tsukuda, E. (Ed.), *Butterflies of the South East Asian Islands*, Vol. 2:205-438. Plapac,Tokyo. (Higher classification and up-to-date groupings of the majority of species from the Oriental Region).

Yata, O. 1990. A new *Eurema* species from south India (Lepidoptera: Pieridae). *Esaki Special News*, (Japan). No.1 (1990):161-165. illus. (Description of *Eurema nilgiriensis* sp. nov. from the Nilgiri Hills).

Yata, O. 1989-1995. A Revision of the Old World genus *Eurema* Hübner (Lepidoptera: Pieridae), Part 1- V. *Bulletin of the Kitakyushu Museum of Natural History*, Japan.(For proper understanding of Oriental Pieridae, these works are useful).

Nymphalidae

Miller, L. D. 1968. The higher classification, phylogeny and zoogeography of the Satyridae. *Memoirs of the American Entomological Society, Number 24.*Pp. i-iii + 1-174. Illustrated. (Also contains extensive bibliography on this group of insects. Higher

classification of the Satyrinae have undergone several changes since this publication. See

DeVries, P. J., Kitching, I. J. & Vane-Wright, R. I. 1985. The systematic position of *Antirrhea* and *Caerois*, with comments on the classification of the Nymphalidae (Lepidoptera). *Systematic Entomology,* 10:11-32, with references. For further discussions, see Ackery, P. R. below. Also R. I. Vane-Wright *in litt.).*

Ackery, P. R. & Vane-Wright, R. I. 1984. *Milkweed Butterflies: their cladistics and biology.* British Museum (Natural History), London. (Systematics: Classification: Taxonomy: Nymphalidae: **Danainae**, contains extensive bibliography. One of the best monographs on any group of butterflies).

Ackery, P. R. 1988. Hostplants and classification: A Review of Nymphalid Butterflies. *Biological Journal of the Linnaean Society*, 33(2):85-203. (Systematics: All the Nymphalidae, contains very good analysis of the Nymphalidae and extensive bibliography).

Harvey, D. J. 1991. In **Nijhout, H. F.** The development and evolution of butterfly wing patterns. xvi+297 pp., 8 pls. Smithsonian Institution Press, Washington D.C. and London. (Includes all the Acraeinae (*Acraea*), *Cethosia, Vindula* and all our Argynnines in the subfamily Heliconiinae. This grouping is followed by de Jong, Ackery and Vane-Wright above. Harvey also included our Amathusiinae as Amathusiini in Morphinae, which is followed above. For the rest of the groups see Ackery above. Also R. I. Vane-Wright, pers. comm.).

Lycaenidae

Eliot, J. N. 1973. The Higher classification of Lycaenidae (Lepidoptera): A Tentative

Arrangement. *Bulletin of the British Museum (Natural History), Entomology,* 28(6):371-505, 162 T.F., 4 tbs, 6 pls. (Systematics: Classification: Taxonomy: All the Lycaenidae except Riodininae).

Eliot, J. N. & Kawazoe, A. 1983. The Blue butterflies of the Lycaenopsis Group. British Museum of Natural History. 309 pp., 6 pls. 560 figs.

Harvey, D. J. 1987. The higher classification of Riodinidae (Lepidoptera). Ph. D. Thesis, University of Texas at Austin. University Microfilms International, Ann Arbor, USA. (The Riodininae is treated as a subfamily in my work).

Bridges, C. A. 1987. Catalogue of Lycaenidae & Riodinidae. (Lepidoptera: Rhopalocera). 816 pp. Urbana, Illinois, USA. (Genus group and species group names).

Hesperiidae

Evans, W. H. 1937. A catalogue of African Hesperiidae. British Museum Natural History, London. xxii+212pp., 30 pls. (For revision of this Family, See *Carcasson's African Butterflies* by Ackery, Smith and Vane-Wright, above).

Evans, W. H. 1949. A Catalogue of the Hesperiidae from Europe, Asia and Australia in the British Museum (Natural History). v+xiv+502, pls. 1-53, 7 figs. (Systematics: Classification: Taxonomy: Hesperiidae. Since this work, various revisions were introduced by different workers within regional faunistic studies. Many taxa regarded as subspecies in Evans have turned out to be distinct species. Nevertheless, this work still remains as the only systematic work on this region).

Fukuda, H. et al. 1984. The life histories of butterflies in Japan. Vol. IV. Hesperiidae. i-

x+1-93, with 64 colour plates. Osaka, Japan. (Many Hesperid species from the Indian, region which extend all the way to southern Japan, are included).

Maruyama, K. 1991. Hesperiidae. In **Otsuka, K.** Butterflies of Borneo. Vol. 2. No. 2. Pp.i-xii+1-89, i-ix+1-83, with 48 colour plates. Tokyo, Japan. (Many species from the Indian region are included. Besides these, most faunistic works contain some revisions).

Bridges, C. A. 1988 . Catalogue of Hesperiidae (Lepidoptera: Rhopalocera). 461 pp. Urbana, Illinois, USA. (Genus group and species group names).

Afterword and Acknowledgements

When I started to survey the butterflies of the Western Ghats in a systematic way during the 1980s, little did I realize how long it would take to complete the task. Since researching and field work (walking, collecting and studying) along the entire 1600km length of this mountain range involved the help of so many persons, I can only hope to thank everybody who were remotely associated with me. Since human beings have no known biophobias associated with butterflies, everyone was instinctively supportive and helpful. I do not know of any recorded culture that has some fear associated with butterflies. Chronologically, I must thank the following Institutions and persons who helped this work.

Denmark, where I have lived since 1968, has one of the finest entomological traditions (cultivated with great zeal by both amateurs and professionals) in the world. In fact, J. C. Fabricius (1745-1808) the famous Danish entomologist can be rightly regarded as the

founder of the science of Entomology. In Copenhagen's Zoological Museum, the late S. L. Tuxen guided, stimulated and supported the foundation for historical research that one needs to do on such an area (with rich natural history) as the Indian region. Since S. L. Tuxen's father, Paul Tuxen was a great Indologist of outstanding integrity, Søren Tuxen's interest in India was also humanistic; it suited me. Without this kind man's interest in India, my project of collecting material of the butterfly fauna of India could not have been possible, except that I had not foreseen then how many years it would take! The same kind of wholehearted support and understanding for my work was continued by Niels Peder Kristensen (the master systematist of the Lepidoptera). I am thankful to him for this. In the same Museum, I would also like to thank Leif Lyneborg, Niels Møller Andersen and Ole Karsholt for their understanding. I have special thanks for the ornithologist and artist Jon Fjeldså, of the Centre for Tropical Biodiversity at the same Museum, for stimulating company and guidance. I am most obliged to all these people. Outside this museum, there is a special band of amateur naturalists (there are plenty of them in Denmark), whose understanding of a subject can easily surpass that of professionals. I have to thank them for most stimulating company and endless (but fruitful) discussions. Especially, Jan Haugum of Vejle and Peder Skov of Funen, but there are many others. The support they have contributed to this project is enormous. There is a very special person, whom I am including here in Denmark, although he no longer stays there, yet for me he is a Dane. Torben Larsen is the only person I know who is not only an outstanding authority on the butterflies of various regions (Arabia, Africa and India), but also shares with me the history (this concerns our love for nature) of belonging to several cultures: Denmark, India and England. I am grateful to him for all these years of support. Besides these persons, so many

others have supported my project that I can only mention some of their names here, not because others are unimportant. They are Paul Pedersen and Ivan Nielsen of Aarhus University, and Minna Skafte-Jensen of Odense University. All but Ivan Nielsen (a tropical botanist) are humanists with a keen interest in nature. A special thanks to Denis Dornoy for computer support and much else. Besides them, Stig Toft Madsen, Holger Andersen, Hanne Puggaard, Susanne Kühl, Claus Lange and my Japanese friend Aki Shibata, who helped me in translating many Japanese publications, have been very supportive.

The Natural History Museum in London is the one institution without which this kind of study could not have been possible. My association with this institution goes back many years. It was my association with R. I. Vane-Wright, the Head of the Biogeography and Conservation Laboratory that made the completion of this study possible. Dick Vane-Wright has not only been professionally supportive throughout this period, but also pulled me up from emotional agony concerning the biodiversity crisis. Dick has also carefully corrected the first draft of this manuscript and pointed out many blunders that I had unwittingly committed. I hope that this collaboration to produce other works on this region will continue. I am also extremely grateful to Phil Ackery and Campbell Smith for their help and hospitality, which always went beyond the normal help extended to a visiting scientist. Of the same Institution, I would like to thank J. D. Holloway [redacted], Jason Weintraub and Malcolm Scoble for various help.

In 1987, at the initiation of Niels Peder Kristensen, The Carlsberg Foundation of Denmark supported a two (1987-1988) year grant to study butterflies in India. Apart from studying

the families of Papilionidae and Pieridae of the entire Indian region, this was mainly utilized to survey the northern Western Ghats. I am extremely grateful to this Foundation for this support. Based in Poona (Pune), with the support of the Bombay Natural History Society, the work was carried out between Feb. 1987 to Feb. 1988. In Pune, I am grateful to Shubhangi Kulkarni, Raju Mehta, Rajindar Jogdale, S. N. Sathe, Meera Kosambi, Nikhil Kumar, Ashok Gopal, K. R. Dixit, R. N. Dandekar and Thomas Gay. At the Bombay Natural History Society, I should like to thank J. C. Daniel, Ulhas Rane, Naresh Chaturvedi, Meena Haribal and Isaac Kehimkar for their support. In Gujarat, I would like to thank Nargis and Sunil Sud, for their help and hospitality.

Without a survey of the southern Western Ghats, one could apparently not assess the fauna of this mountain Range. The renowned Kannada writer U. R. Anantha Murthy, the present President of the Indian Sahitya Akademy, who was then the Vice Chancellor of the Mahatma Gandhi University, at Kottayam in Kerala, made that possible by inviting me as a Visiting Scientist. I am thankful to him for showing confidence in a butterfly research scientist to lead some environmental studies at his University. So, from December 1990 to December 1991, we spent some of the best months of butterfly hunting (in the Nabokovian sense, see his Speak Memoty) in Kerala. I should like to thank the University authorities for making our stay enjoyable, especially O. V. Usha for her guidance. The Kerala Forest Department not only granted permission to work in their forests, but also made necessary arrangements for me to move around. I am extremely grateful to them and to P. N. Unnikrishnan (then the Chief Wildlife Warden of Silent Valley) for their support. To M. Gangadharan and Rajan Gurukal (both from M. G. University), I am also grateful

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After having surveyed the northern and southern Western Ghats, the central section which is in Kerala, Tamil Nadu (admirably surveyed by Torben Larsen), Karnataka and parts of Goa remained, to complete the entire area. The Danida Research Council of the Royal Danish Ministry of Foreign Affairs (Rådet for Ulandsforskning) readily agreed to support such a project. I am grateful to them for this generosity. When I approached Madhav Gadgil about the possibility, he willingly invited me to the Centre for Ecological Sciences at the Indian Institute of Science, Bangalore. I am extremely grateful to him for allowing me to share, interact and participate in their work on the biodiversity of the Western Ghats. This Institution has some of the finest biologists in India, with an admirable environment for the field scientist. I should like to thank my colleagues for making me feel at home. Especially, Raghavendra Gadagkar (the present Chairman of the Centre), N. V. Joshi, Raman Sukumar, Subash Chandran, Janardhan Pillai, Arun Venkataraman, Geetha Gadagakar and all the other members, for making my stay not only profitable but also enjoyable. I would also like to thank the members of the Western Ghats Biodiversity Network for sharing with me the concern for the decline of biodiversity, and for feedback with important information. Thanks also to Father Cecil J. Saldanha (the Botanist) for

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